



ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2020; 6(3): 77-80
© 2020 IJADS
www.oraljournal.com
Received: 04-09-2020
Accepted: 06-10-2020

Rahul Gupta

Post Graduate Student,
Department of Conservative
Dentistry and Endodontics,
Bapuji Dental College and
Hospital, Davangere,
Karnataka, India

Sophia Thakur

Professor, Department of
Conservative dentistry and
Endodontics, Bapuji Dental
College and Hospital, Davangere,
Karnataka, India

Fares KT

Post Graduate Student,
Department of Conservative
dentistry and Endodontics,
Bapuji Dental College and
Hospital, Davangere,
Karnataka, India

Arun Jaysheel

Reader, Department of
Conservative Dentistry and
Endodontics, Bapuji Dental
College and Hospital, Davangere,
Karnataka, India

Corresponding Author:

Rahul Gupta

Post Graduate Student,
Department of Conservative
dentistry and Endodontics,
Bapuji Dental College and
Hospital, Davangere,
Karnataka, India

A dilemma to posterior post-endodontic restorations: A review

Rahul Gupta, Sophia Thakur, Fares KT, Arun Jaysheel

DOI: <https://doi.org/10.22271/oral.2020.v6.i4b.1049>

Abstract

The ideal restoration of a root filled tooth is quite a controversial and a widely discussed topic. Due to its vast filled and clinical expertise required, the coronal rehabilitation of an endodontically treated teeth presents quite a challenge for clinicians. A thorough coronal seal essential for the longevity of the restoration. This review article discuss the factors involved in the clinical decision making and the various restorative options for the posterior post endodontic restorations.

Keywords: Post endodontic restoration, post and core, Endocrown

Introduction

Root canal treatment is the procedure of treating endodontic disease by evacuating bacteria from the root canal space followed by subsequent filling and rehabilitation [1, 2]. However, there is always a fear lacking on the further margins or leakage of micro-organisms in the root canal space which will compromise and result in the failure of the treatment [3]. A proper and timely coronal seal is necessary for prevention of cracks and fractures, the endodontically treated teeth coronal seal can vary from an interim restoration, a temporary restoration and a definitive restoration [4]. A interim restoration is one that provides structural integrity to the tooth while the endodontic treatment is going on [5]. Temporary restoration are the one which are placed in the access cavity and provides coronal seal during the inter-appointments, whereas definitive restoration are the which shall be placed as soon as possible following the completion of root canal procedure. Nowadays a concept of double seal is emerged which incorporates the placement of two temporary restorative material inside of one [5]. Following such temporary restoration a final restoration would be needed for the functional support of the tooth [6]. A final restoration would merge from direct composite resin, indirect adhesive restorations such as inlays, onlays, post and core retained restoration, conventional full coverage restoration or a more recent endocrown restorative procedure. The closure for a final definitive restoration is dictated by several factors such as the number of coronal tooth surface or walls remaining, the amount of root dentine remaining, the location or position of the tooth in the arch and the cost factor involved.

A. Amount of coronal tooth structure remaining:- The coronal restoration of tooth structure depends on the number of remaining walls and the thickness of coronal dentin [7]. When there is a presence of all intact walls, ie, class I cavity with intact wall marginal ridges a direct composite restoration will be effective. When there is a 2-3 surface cavity, an adhesive composite restoration followed by a ceramic or metal crown is given. However when there is more walls are missing or the remaining coronal dentinal thickness is less than 2mm, a post followed by a core is indicated enveloped by a ceramic or metal crown [8].

B. Amount of radicular dentin remaining:- The use of different rotary or reciprocating files during root canal preparation aided with various chemical irrigants weakens the residual tooth structure and makes it more prone to fracture^[9]. Taper of the file instrumented affects the strength of the root dentine as greater taper reduces more dentine^[10]. In case a post-retention is required, the post space preparation in an already thinned and weakened root, would make it more prone to fracture^[11]. Thus a better less invasive and adhesively retained to the pulp chamber space like an endocrown restoration would give a better results. Also the crown-root ratio and the height of the alveolar bone in relation to the root would effect the post-endodontic restoration^[12].

C. Location or position of the tooth:- The position of the tooth plays an important role in decision of post endodontic restoration. It has been noted that restoration of maxillary posterior teeth are more likely to fail than mandibular posterior teeth^[13]. The occlusal forces acting on molars are way more than premolars and anteriors.¹⁴ Incase, there is a supplementation of occlusal disharmony such as para-functional habits like bruxism etc, there would be greater chances of failure like post fracture or debonding of the composite restoration. The position and width of the premolars are more prone to lateral compressive or tensile stress, so in such tooth, a post would be helpful if cuspal protection is required^[15].

D. Cost factor:- The best treatment option should be decided for the final restoration without compromises on its feasibility and reliability. However several patient related factors like the cost of the procedure, habits, occupation and their expectation needs to be given equal consideration on the final post endodontic restoration^[16].

Several studies have been done which have postulated the importance of either a good coronal restoration or a good endodontic treatment on the outcome of the periapical status of the treated teeth. Studies by Ray and hope^[17], Honstad *et al.*,^[18] Hommy *et al.*,^[19] Segura-E gen *et al.*^[20] and Ng *et al.*^[21] have concluded a better periapical status outcome of good coronal seal matter than a good endodontic treatment. The different treatment modalities following an endodontic treatment can vary from a direct composite restoration, conventional full coverage restoration, post and core retained crowns or Endocrowns.

Post and core restorations are recommended in compromised tooth structure, ie missing less than 50% of remaining tooth structure or when two or fewer walls are present^[22]. Several factors effect the post retention such as length of the root, tooth anatomy, post width and canal configuration and post adaptability, coronal tooth structure and position of the teeth in the arch^[23]. The different types of posts are summarized as:-

1. Based on retentiveness

- Active posts:-** Engages of the walls of the canal, more retentive but induces more stress on to the root.
- Passive post:-** Retained mainly by luting cement

2. Based on shape

- Parallel post:-** More retentive, induces less stress due to less wedging effect (Figure 1)
- Tapered post:-** Less dentin removal & less retentive as compared to parallel post



Fig 1: parallel threaded post

Fig 2: Carbon fibre post

3. Based on material

- Titanium alloy post
- Custom cast post
- Ceramic and zirconia post
- Fibre posts (Figure 2)

4. Prefabricated posts

- Made up of stainless steel, Ni-Cr or titanium alloy
- Round in shape, offer little resistance to rotational forces should be incorporated like slots and pins
- Quite strong and rigid (except titanium alloys)^[24].

However several drawbacks are associated with the intra-radicular retention such as

- Removal of additional radicular dentin
- Increased tendency to root fracture
- Increased number of interfaces between the post-cement-core-tooth structure^[25].

In case a metal posts (Figure 4) are used, there is a tendency of occurrence of fracture due to the greater rigidity of metal posts as compared to that of dentin. Thus increasing the stress concentration within the post or tooth-post interface^[26]. In case of use of glass fibre post, there is always a risk of post restoration debonding, although due to similar elastic properties between glass fibre post and dentin, there is prevention of fracture, giving it an advantage over metal posts^[27]. To overcome these drawbacks, Endocrown restorations were introduced as being minimally invasive and esthetically functional restorations. It is indicated in molars, exhibiting large coronal restorations or having slot, dilacerated or fragile roots^[28]. (Figure 3) It anchors to the internal portion of the pulp chamber by macro and micromechanical retention, which is provided by pulp walls and the adhesive cementation^[28]. Endocrowns offer several advantages as compared to conventional and post retained restorations in terms of its preparation technique, occlusal thickness and elastic modulus^[29]. It negates the ferrule preparation seen in conventional crown preparation, thus preserving initial enamel and dentin. The occlusal thickness in conventional restorations varies between 1.5 – 2mm, where as it goes upto

3 – 6mm in endocrowns, thus offering greater occlusal bonding [30]. post retained functional prosthesis are prepared with materials of different elastic modulus as seen in glass or metal reinforced fibre for post and ceramic or composite for core. Due to this, several interfaces would exist between dentin, luting agent and the restorative material, causing stiffness mismatch [31]. Endocrown enables upon its monoblock nature, thus offering greater stress loading [31].

A proper treatment planning with respect to the particular case is required, taking into the correlation of the enamel and radicular dentinal tubules to ensure the success and longevity of the posterior post endodontic restoration.

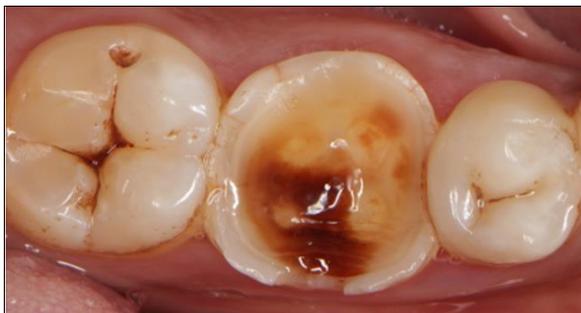


Fig 3: Tooth structure for endocrown requisite



Fig 4: Metal post

Conclusion

Coronal restoration of an endodontically treated teeth is of prior importance in its long term clinical and functional stress. A proper decision making should be done based on the amount of coronal and radicular tooth structure remaining, location or position of the tooth on the arch and its cost consideration.

References

1. European Society of Endodontology. Quality Guidelines for endodontic treatment: consensus report of the European Society of Endodontology. *Int. Endod J.* 2006; 39:921-930.
2. Ingle JJ, Bakland LK, Baumgartner JC. *Ingle's endodontics*/John I. Ingle, Leif K. Bakland, J. Craig Baumgartner. Hamilton, Ont.: BC Decker; 2008.
3. Kishen A. Mechanisms and risk factors for fracture predilection in endodontically treated teeth. *Endodontic topics.* 2006; 13(1):57-83.
4. Eliyas S, Jalili J, Martin N. Restoration of the root canal treated tooth. *Br Dent J.* 2015; 218(2):53-62.
5. Cohen S, Hargreaves K M. *Pathways of the pulp*, 9th ed. Mosby Elsevier, 2006.
6. Zarow M, Ramírez-Sebastià A, Paolone G, de Ribot Porta J, Mora J, Espona J *et al.* A new classification system for the restoration of root filled teeth. *Int. Endod J.* 2018; 51(3):318-334.
7. Abdulrazzak SS, Sulaiman E, Atiya BK, Jamaludin M. Effect of ferrule height and glass fibre post length on fracture resistance and failure mode of endodontically treated teeth. *Australian Endodontic Journal.* 2014; 40:81-6.
8. Ng YL, Mann V, Gulabivala K. Tooth survival following non-surgical root canal treatment: a systematic review of the literature. *Int. Endod J.* 2010; 43:171-189.
9. Nagaraja S, Sreenivasa Murthy BV. CT evaluation of canal preparation using rotary and hand NI-TI instruments: An *in vitro* study. *J Conserv Dent.* 2010; 13(1):16-22.
10. Xu J, He J, Yang Q, Huang D, Zhou X, Peters OA, Gao Y. Accuracy of Cone-beam Computed Tomography in Measuring Dentin Thickness and Its Potential of Predicting the Remaining Dentin Thickness after Removing Fractured Instruments. *J Endod.* 2017; 43(9):1522-1527.
11. Z. Zhu XY, Dong S, He X, Pan L. Tang, Effect of post placement on the restoration of endodontically treated teeth: a systematic review, *Int. J. Prosthodont.* 2015; 28(5):475-483.
12. Ramirez-Sebastia A, Bortolotto T, Cattani-Lorente M, Giner L, Roig M, Krejci I. Adhesive restoration of anterior endodontically treated teeth: influence of post length on fracture strength, *Clin. Oral Investig.* 2014; 18(2):545-554.
13. Ferrari M, Cagidiaco MC, Goracci C *et al.* Long-term retrospective study of the clinical performance of fiber posts. *American Journal of Dentistry.* 2007a; 20:287–91.
14. Peutzfeldt A, Sahafi A, Asmussen E. A survey of failed post-retained restorations. *Clinical Oral Investigations.* 2008; 12:37-44.
15. Dietschi D, Ardu S, Rossier-Gerber A, Krejci I. Adaptation of adhesive post and cores to dentin after *in vitro* occlusal loading: evaluation of post material influence. *Journal of Adhesive Dentistry.* 2006; 8:409-19.
16. Zitzmann NU, Krastl G, Hecker H, Walter C, Weiger R. Endodontics or implants? A review of decisive criteria and guidelines for single tooth restorations and full arch reconstructions. *International Endodontic Journal.* 2009; 42:757-74.
17. Ray HA, Trope M. Periapical status of endodontically treated teeth in relation to the technical quality of the root filling and the coronal restoration. *Int. Endod J.* 1995; 28: 12–18.
18. Tronstad L, Asbjørnsen K, Døving L, Paedersen I, Eriksen HM. Influence of coronal restorations on the periapical health of endodontically treated teeth. *Endod Dent Traumatol.* 2000; 16:218-221.
19. Hommez GM, Coppens CR, De Moor RJ. Periapical health related to the quality of coronal restorations and root fillings. *Int Endod J.* 2002; 35:680-689.
20. Segura-Egea JJ, Jimenez-Pinzon A, Poyato-Ferrera M, Velasco-Ortega E, Rios-Santos JV. Periapical status and quality of root fillings and coronal restorations in an adult Spanish population. *Int. Endod J.* 2004; 37:525-530.
21. Ng YL, Mann V, Gulabivala K. A prospective study of the factors affecting outcomes of non-surgical root canal treatment: part 1: periapical health. *Int. Endod J.* 2011;

- 44:583-609.
22. Meyenberg K. The ideal restoration of endodontically treated teeth - structural and esthetic considerations: a review of the literature and clinical guidelines for the restorative clinician. *European Journal of Esthetic Dentistry*. 2013; 8:238-68.
 23. Akkayan B, Gulmez T. Resistance to fracture of endodontically treated teeth restored with different post systems. *Journal of Prosthetic Dentistry*. 2002; 87:431-7.
 24. Theodosopoulou JN, Chochlidakis KM. A systematic review of dowel (post) and core materials and systems. *Journal of Prosthodontics: Implant, Esthetic and Reconstructive Dentistry*. 2009; 18(6):464-72.
 25. Lazari PC, Oliveira RC, Anchieta RB, Almeida EO, Freitas Junior AC, Kina S *et al.*, Stress distribution on dentin-cement-post interface varying root canal and glass fiber post diameters: a three-dimensional finite element analysis based on micro-CT data, *J Appl. Oral Sci*. 2013; 21(6):511-517.
 26. Fokkinga WA, Kreulen CM, Vallittu PK, Creugers NH. A structured analysis of *in vitro* failure loads and failure modes of fiber, metal, and ceramic post-and-core systems. *International Journal of Prosthodontics*. 2004; 1:17(4).
 27. Kalkan M, Usumez A, Ozturk AN, Belli S, Eskitascioglu G. Bond strength between root dentin and three glass-fiber post systems. *The Journal of prosthetic dentistry*. 2006; 96(1):41-6.
 28. Sevimli G, Cengiz S, Oruc MS. Endocrowns: review. *J Istanbul Univ Fac Dent*. 2015; 49(2):57-63
 29. Biacchi GR, Mello B, Basting RT. The endocrown: an alternative approach for restoring extensively damaged molars. *J Esthet Restor Dent*. 2013; 25(6):383-390.
 30. Motta AB, Pereira LC, Duda FP, Anusavice KJ. Influence of substructure design and occlusal reduction on the stress distribution in metal ceramic complete crowns: 3D finite element analysis. *J Prosthodont*. 2014; 23(5):381-389.
 31. Tay FR, Pashley DH. Monoblocks in root canals: a hypothetical or a tangible goal, *J Endod*. 2007; 33(4):391-398