

Management of grossly destroyed endodontically treated teeth with lock and key custom modified cast post and core design: A case series

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Abstract

The purpose of this paper is to demonstrate a more retentive custom modified lock and key design of metal cast post and core for the restoration of grossly destroyed endodontically treated molar tooth. The lock and key metal cast post consists of two parts, one in the distal canal (primary post) and the other one in mesio-lingual canal (secondary post). The primary post has a lock design, while the secondary post contains the key design, both of which interlock together. Lock and key cast post, mentioned in this report can be an effective design for the management of grossly destroyed molar teeth.

Keywords: Lock and key post, management of grossly destroyed teeth, multiple post, post and core, split post

Introduction

Restoration of grossly destroyed endodontically treated teeth is a challenging task for the practitioner and requires careful treatment planning. If the teeth that more than half of its crown structure lost the post with core build-up may be required to restore such teeth. Teeth with extensive loss of tooth structure, especially where no cavity wall is remaining, the insertion of posts appears necessary to provide for core material retention.^[1] Traditional teaching says, that post space preparation should leave a minimum of 3–5 mm of Gutta-Percha in the apical portion to maintain an adequate seal;^[2] however 3 mm of Gutta-Percha provides an unreliable apical seal therefore at least 4–5 mm of apical Gutta-Percha is recommended.^[3] Goodacre and Spolnik^[4] recommend post length equal to three fourth of the length of root canal, if possible, or at least equal to the length of the crown. In teeth with divergent roots when two separate posts are used, aforementioned recommended post length may not be necessary. The divergent posts provide adequate retention even with much shorter post

length.^[5] A single unit metal cast post in molar tooth with divergent root canals is difficult to fabricate because of the differential path of insertion of the posts. Multiple posts like split post may create splitting force when cemented as separate posts. This lock and key post and core were designed with the aim of ease of insertion in molar tooth with divergent roots and retention also providing an interlocking feature to resist the spitting forces.

Design of Post and Core

Inlay wax (GC Corp., Tokyo, Japan) was used for fabricating post and core pattern in disto-lingual canal. This was considered as the primary post along with which almost 80% of the core structure was also constructed. During the construction of the core structure, an inverted cone shape or lock design was incorporated in it. The wax pattern was converted into the metal post by casting. The cast metal post was cemented into the disto-lingual canal using glass ionomer cement (GC Corporation Tokyo, Japan). Post space was then prepared in the mesio-lingual canal using size 3 Peeso reamers (Dentsply, Maillefer, Switzerland) and dowel space impression was taken using inlay wax. This acts as the secondary post and contains the remaining 20% of the core structure. This part of the core exactly fits into the lock design of primary core and acts as the key. Casting of the fabricated wax pattern was done, and the secondary post was cemented in to the mesio-lingual canal using glass ionomer cement.

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Case Reports

Case 1

A 20-year-old female patient reported to our Department of Conservative Dentistry and Endodontics with the chief complaint of grossly decayed lower right back tooth. Preoperative radiograph revealed dental caries in relation to 46 with pulp exposure. Treatment options include

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extraction, followed by fixed prosthesis and root canal treatment, followed by post and core were explained. Patient opted to conserve her tooth, so endodontic treatment, followed by post and core placement was decided as the treatment plan. After access opening, biomechanical preparation of root canals was done with rotary protaper files (Dentsply maillefer Ballaigues). About 5.25% NaOCl (Novo Dental Product Pvt Ltd., Mumbai, India) was used to irrigate the root canals. Obturation was done using endomethasone sealer and Gutta-Percha. After 1 week patient was recalled, and post space preparation was done in disto-lingual canal up to size 3 Peeso reamer (Dentsply Maillefer, Switzerland). Primary post space pattern was taken using inlay wax and the core pattern was fabricated with a lock design. Casting was done, and the primary post was cemented in the distal canal using glass ionomer cement (GC Corporation Tokyo, Japan). Post space was then prepared in the mesio-lingual canal using Peeso reamers up to size 3. The post space pattern was taken with the rest of the core part constructed along with a key design. After casting, the secondary post was cemented in to the mesio-lingual canal using glass ionomer cement. Porcelain fused to metal crown was given as the final restoration over the cast metal post and core restoration [Figure 1].

Follow-up was done after 6 months and 1 year. The restored tooth was evaluated clinically as well as radiographically.

The tooth is functioning normally without any signs and symptoms [Figure 2].

Case 2

A 26-year-old female patient reported to our department with the chief complaint of pain in her lower right back tooth for the past 1 week, clinical examination revealed grossly decayed 47, preoperative radiograph revealed pulpal involvement. Treatment options include extraction followed by fixed prosthesis and root canal treatment, followed by post and core were explained. Patient opted for endodontic treatment followed by post and core placement. The lock post was placed in the distal canal, and the key post was placed in mesio-lingual canal. All the clinical steps for the fabrication of lock and key post and core were followed as mentioned in case 1 [Figure 3]. Follow-up was done after 6 month and 1 year. The restored tooth was evaluated clinically as well as radiographically. The tooth is functioning normally without any signs and symptoms [Figure 4].

Case 3

A 28-year-old male patient reported to our department with the chief complaint of decayed lower right back tooth for the past 1 week, clinical examination revealed grossly decayed 46, preoperative radiograph revealed pulpal involvement. Treatment options include extraction, followed by fixed prosthesis and root canal treatment

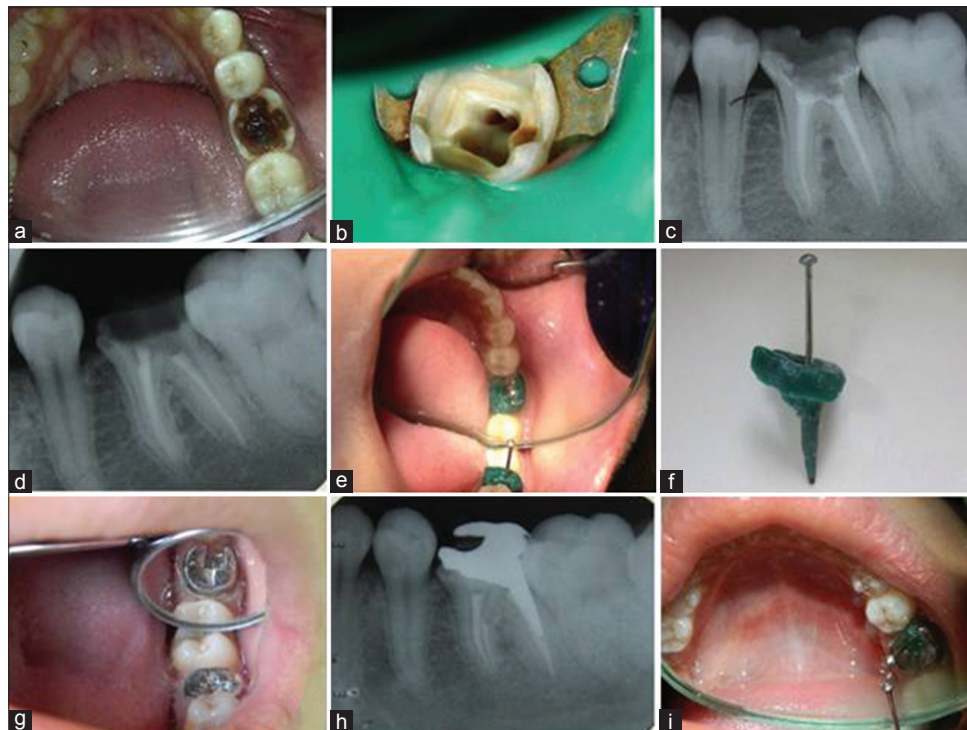


Figure 1: (a) Preoperative clinical view. (b) Access opening in 36. (c) After obturation. (d) Gutta-Percha removed from disto-lingual canal. (e) Primary (lock) post and core wax pattern construction. (f) Fabricated lock post and core wax pattern. (g) Primary (lock) post and core was cemented. (h) Gutta-Percha removed from mesio-lingual canal. (i) Secondary (key) post and core wax pattern construction

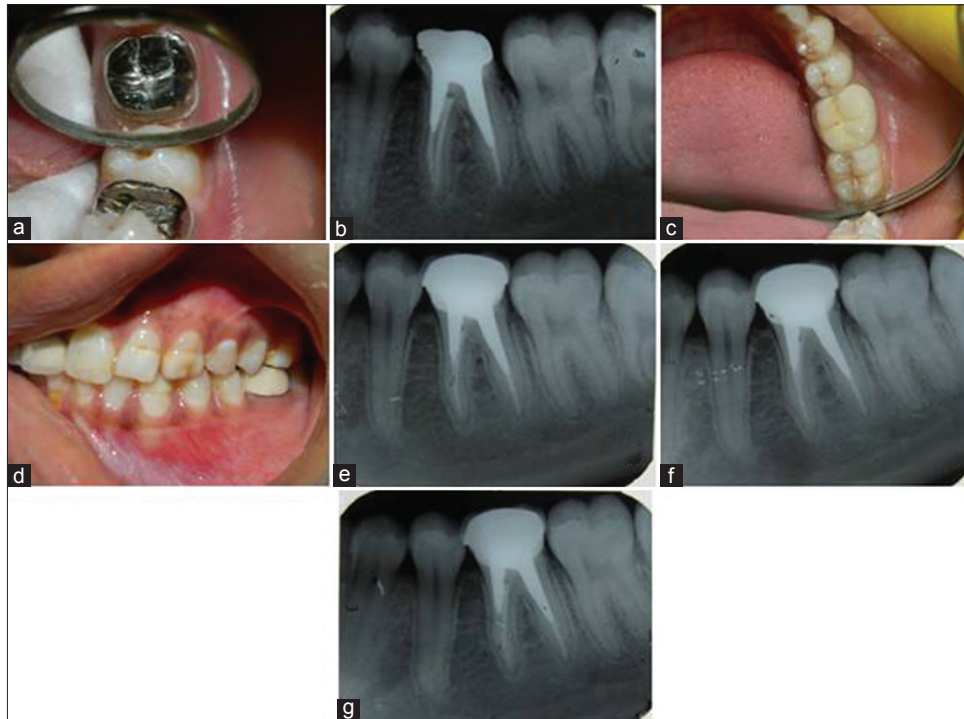


Figure 2: (a) Secondary (key) post and core was cemented. (b) Radiographic view after the lock and key post was cemented. (c) Porcelain fused metal ceramic crown was cemented (occlusal view). (d) Porcelain fused metal ceramic crown was cemented (buccal view). (e) Radiograph after the preformed metal crown cementation. (f) Six month review. (g) One year review

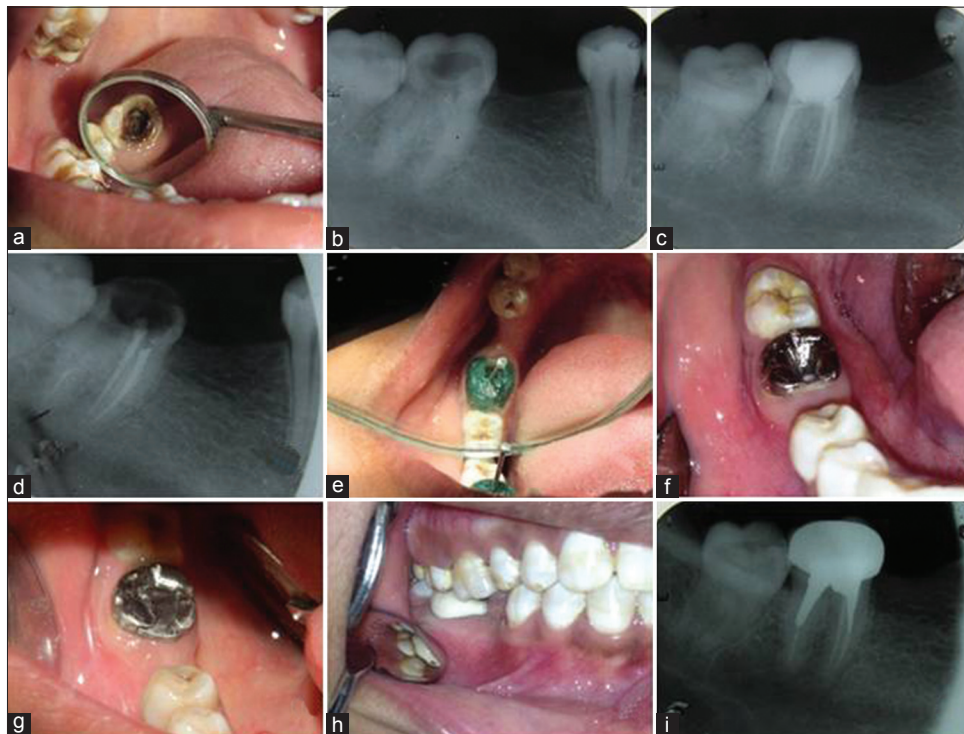


Figure 3: (a) Preoperative clinical view. (b) Preoperative radiograph. (c) After obturation. (d) Gutta-Percha removed from distal canal. (e) Primary (lock) post and core wax pattern construction. (f) Primary (lock) post and core was cemented. (g) Secondary (key) post and core was cemented. (h) Porcelain fused metal ceramic crown was cemented (buccal view). (i) Radiograph after the preformed metal crown cementation

followed by post and core were explained. Patient opted for endodontic treatment followed by post and core

placement. The lock post was placed in the distal canal, and the key post was placed in mesio-lingual canal. All

the clinical steps for the fabrication of lock and key post and core were followed as mentioned in case 1 [Figure 5]. Follow-up was done after 6 month and 1 year. The restored tooth was evaluated clinically as well as radiographically. The tooth is functioning normally without any signs and symptoms [Figure 6].

Case 4

A 25-year-old female patient reported to our department with the chief complaint of grossly destroyed lower right back tooth. Clinical examination revealed root canal treated 46 without coronal restoration. The tooth was free of sign and symptoms, intra oral periapical radiograph revealed adequately filled root canal. Treatment plan was explained to the patient that the restoration of the tooth can be done using split cast post and core. The lock post was placed in the distal canal, and the key post was placed in mesio-lingual canal. All the clinical steps

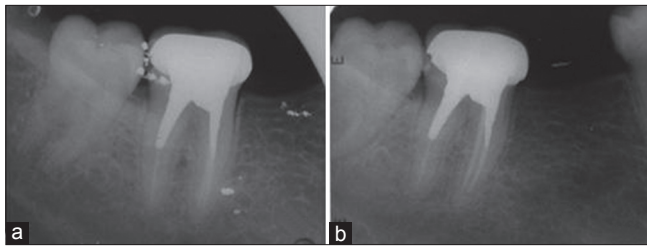


Figure 4: (a) Six month follow-up. (b) One year follow-up

for the fabrication of lock and key post and core were followed as mentioned in case 1 [Figure 7]. The restored tooth was evaluated after 6 months by clinically and radiographically. The tooth is functioning normal without any signs and symptoms.

Discussion

As the tooth was grossly destroyed due to dental caries the decision of post and core build up was taken. Prefabricated fiber post is also an option for management of such teeth but in our cases teeth structure was lost more than half of its structure hence the custom fabricated cast post and core decision was taken. The recommended post length is three fourth of the root length^[4] with at least 4–5 mm apical Gutta-Percha remaining in the canal to ensure adequate apical seal.^[3] Making a single post in the distal canal may not give proper retention as well as long post space preparation along recommended length guidelines may predispose toward iatrogenic error like perforation. Bass suggested when two posts are utilized in divergent roots adhering to this post length may not be necessary and shorter posts may provide adequate retention. In such scenario it may not be even essential to achieve a diameter of the post equal to one third of the root width.^[5] To achieve adequately retained core restoration in the grossly decayed teeth, we decided to place two posts. According to Schwartz and Robbins, the post should be placed in the



Figure 5: (a, b) Preoperative clinical view. (c) Preoperative radiograph. (d) After obturation. (e) Primary (lock) post and core was cemented. (f) Secondary (key) post and core was cemented. (g) Porcelain fused metal ceramic crown was cemented - occlusal view. (h) Radiograph of lock and key post. (i) Porcelain fused metal ceramic crown was cemented - buccal view

largest and straightest canal which is the palatal canal in the maxillary molars and a distal canal in the mandibular molar.^[6] In our cases, two posts were decided to be placed in distal canal and mesio-lingual canal. Since construction of two posts in a single unit is not possible because of the hindrance to the path of insertion in divergent roots hinder we decided to place the post and core in two units as split post and core. Tooth restored with two unit post system when subjected to splitting forces (like vertical and mesio-distal movement forces) may move independently facilitating fracture of the tooth. It was on this rationality that a lock and key design was incorporated to unify both the post into a single unit thereby increasing the fracture resistance against splitting forces. An inverted cone shape design with a base in primary post toward the distal side provided the lock component of the post and core restoration. The key design was incorporated with secondary post placed in mesio-lingual canal to exactly fit in to the lock design. The primary and the secondary post were, therefore, held together to act as a single unit. This design may help in resisting the splitting forces on post and core by the vertical load and the mesio-distal movements of the tooth. Ferrule is an important component in post and core because its primary function is resistance in

root fracture and some extent it provides retention also. Recommended guideline also states that ferrule should be incorporated in post and core design. However, it has been concluded that a ferrule is desirable, but should not be provided at the expense of the remaining tooth/root structure.^[7] In our case, tooth already destroyed grossly and some surfaces does not have the sufficient structure to provide a ferrule. Hence we have not provided the ferrule. Two units were constructed in two different appointments with inlay wax being used for fabricating the post and core pattern. Split type cast post and core already reported in literature in those either one post was custom fabricated the other one was preformed post,^[8] if both were custom modified post there was no interlocking feature among post and core.^[9] In our case both were custom modified and unified with lock and key design. We must acknowledge that this may take one or two extra appointments for the patient. However considering the good outcome this can be justifiable. We also suggest that a single appointment lock and key post and core pattern can be fabricated by using inlay wax in primary post and core and acrylic resin for fabricating secondary post and core pattern. This may also be achievable by using acrylic resin for fabricating both the primary, as well as secondary post and core pattern. Follow-up after 6 month and 1 year was carried out to check the success of the post and core by clinical and radiographic evaluation.

Conclusion

The lock and key metal cast post and core mentioned in this case series could be an effective method for the restoration of grossly destroyed molar teeth reducing the risk of root fracture.

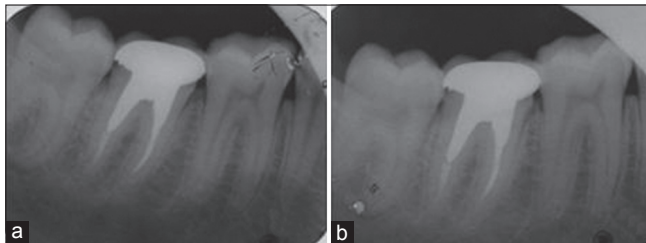


Figure 6: (a) Six month follow-up. (b) One year follow-up

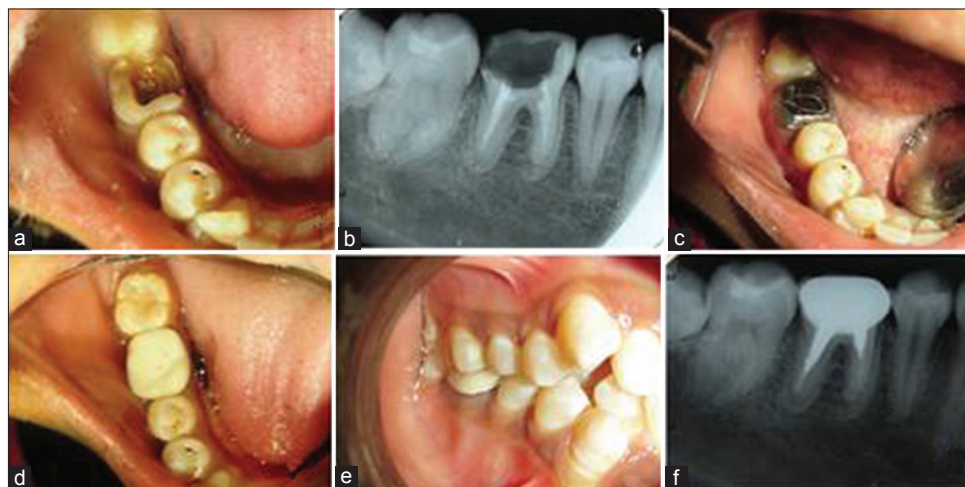


Figure 7: (a) Preoperative clinical view of 46. (b) Obturation in 46. (c) Lock and key post cemented. (d) Porcelain fused metal ceramic crown was cemented - occlusal view. (e) Porcelain fused metal ceramic crown was cemented - buccal view. (f) Six month follow-up

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