DOI: 10.7860/JCDR/2025/79129.21181

Case Report

Dentistry Section

Impression Technique for Crafting Precise Cast Metal Posts in Permanent Anterior Teeth: A Report of Two Cases

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ABSTRACT

Restoring endodontically treated young permanent anterior teeth with significant structural loss presents considerable restorative challenges, necessitating durable and well-fitting treatment options such as custom cast metal posts. Achieving precise post space impressions is critical for success; however, conventional methods have limitations. This case report presents two clinical cases involving three anterior teeth with large canals and introduces a direct technique for crafting custom cast metal posts, evaluated for its dimensional accuracy and clinical fit. Three young patients requiring post-and-core restorations following endodontic treatment of anterior teeth were managed using this technique. Subsequent fabrication and cementation of cast metal post-cores resulted in restorations demonstrating satisfactory volumetric accuracy, dimensional stability, and overall fit upon radiographic evaluation by independent examiners. No adverse postoperative signs or symptoms were observed during follow-up periods of three to six months. This technique proved to be a cost-effective, clinically efficient, and accurate method for obtaining post space impressions, particularly suitable for the large, tapered canals often found in young permanent anterior teeth. It offers a viable alternative to traditional materials, although further long-term clinical studies are warranted on different post space impression techniques.

Keywords: Acrylic resins, Cast metal post and core, Custom-made cast metal post, Dimensional accuracy, Post-space impression

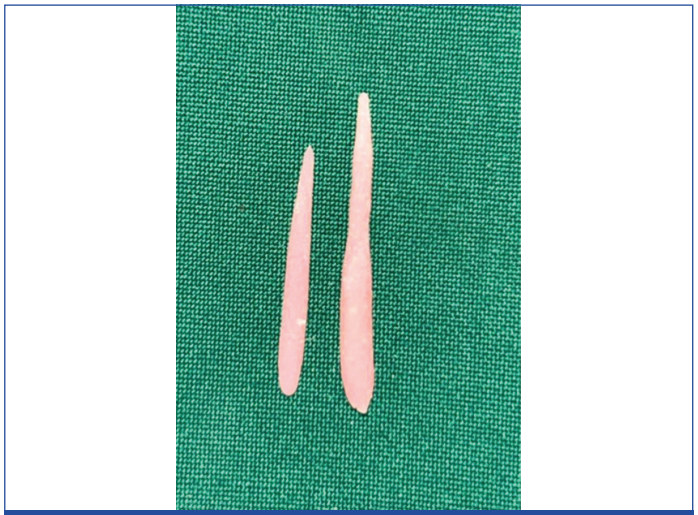
CASE REPORTS

Case 1

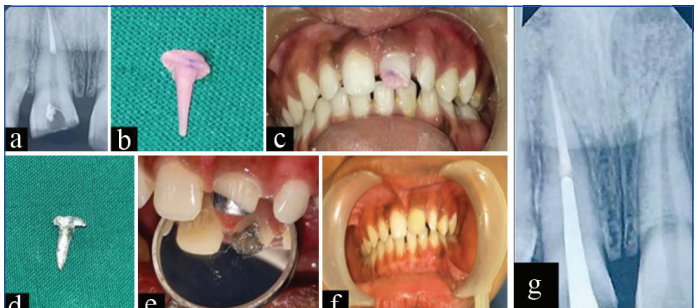
A 14-year-old female with pain and swelling concerning tooth #21 was diagnosed with a chronic periapical abscess. Informed consent was obtained from the parents, following which endodontic treatment was performed. The gutta-percha was removed using up to a #04 peeso reamer, while maintaining an adequate apical seal. The decision to use a custom cast metal post was based on the specific clinical challenge presented by the large, tapered canal, prioritising structural integrity. More than 5 mm of gutta-percha was retained apically to maintain an effective seal in a wide, flared canal with a compromised apical constriction, thereby minimising microleakage and supporting a long-term prognosis [1].

A template was fabricated using self-curing acrylic resin to replicate the desired dimensions of the post space, including length, diameter, and taper [Table/Fig-1]. After thoroughly lubricating the post space with an edible oil, the acrylic resin was mixed to a dough-like consistency. The template was then used to guide the placement of the resin within the canal. Simultaneously, the core material was adapted to the tooth surface. The set mass was carefully removed to evaluate the impression. This process was repeated several times to refine the impression until a smooth and accurate fit was achieved. Following this, preparation of the core, along with the remaining tooth structure, was performed according to the conventional procedures for tooth reduction. Subsequently, the template was sent to the dental laboratory for the fabrication of a custom cast metal post-core, which was later analysed by two examiners for dimensional accuracy. After final finishing, the unit was cemented using luting Glass Ionomer Cement (GIC).

A pre-luting radiograph was taken before cementation, and the post-core was luted using type I GIC. The post-core unit was modified for a zirconia crown, which was later cemented using type I GIC. A fibre post was not used in this case, as it would not have met the dimensional requirements or strength for such a large canal [Table/Fig-2a-g].



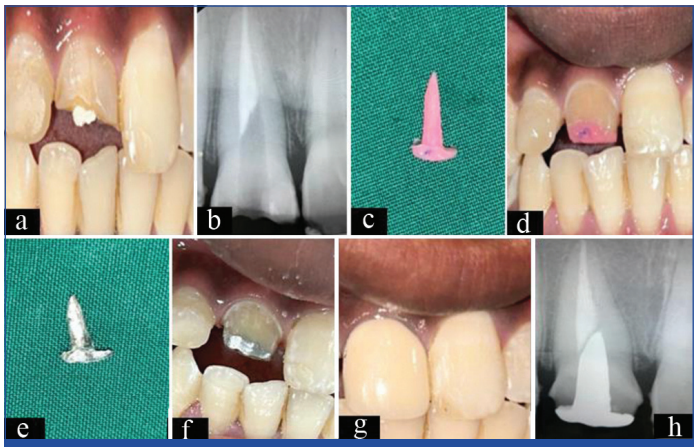
[Table/Fig-1]: Template of two sizes made of self-cure acrylic resin used to fabricate post space impression.



[Table/Fig-2]: Case 1: a) Radiograph after Gutta Percha (GP) removal and preparation of canal space w.r.t #21; b) Post space impression made of acrylic resin; c) After primary preparation of the core; d) Cast metal post-core; e) After cementation; f) Postoperative image after cementation of crown; g) Postoperative radiograph.

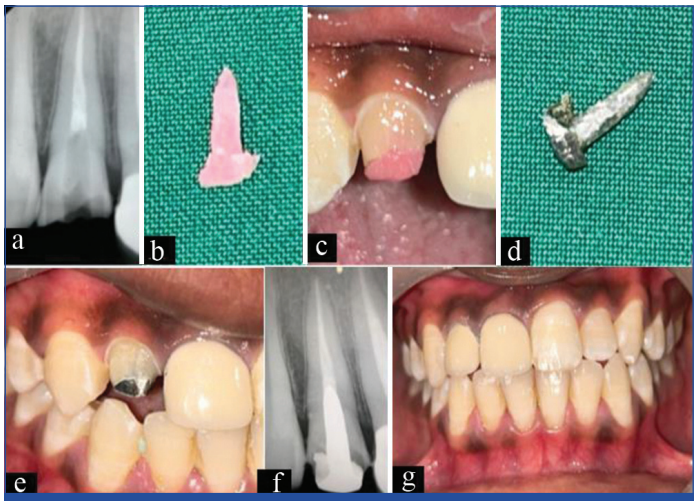
Case 2

A 13-year-old male complained of a dislodged post-endodontic restoration concerning tooth #11 (both #11 and #12 had been previously treated endodontically). As there were no signs or symptoms of periapical inflammation, a custom cast metal post-core was planned. The gutta-percha was removed using a #04 peeso reamer, with more than 5 mm of gutta-percha remaining apically, taking into account the considerations made in Case 1 (as per the recommendations by Mattison GD et al., [1]). The cementation of the post and core was performed using Type I GIC. A Porcelain-Fused-to-Metal (PFM) crown was then cemented using Type I GIC [Table/Fig-3a-h].



[Table/Fig-3]: Case 2 (a): a) Pre-operative image w.r.t #11; b) Pre-operative radiograph after GP removal; c) Post-space impression made up of acrylic; d) After primary preparation of the core; e) Cast metal post-core; f) After cementation; g) Postoperative image after cementation of crown; h) Postoperative radiograph.

The same patient later experienced trauma to tooth #12, resulting in the displacement of the post-endodontic composite restoration. Since there were no signs of infection, a treatment plan similar to that of the previous tooth was implemented [Table/Fig-4a-g,5].



[Table/Fig-4]: Case 2 (b): a) radiograph after GP removal w.r.t #12 and preparation of canal space; b) Post-space impression made of acrylic resin; c) After primary preparation of the core; e) Cast metal post-core; f) Radiograph after cementation; g) Postoperative image after cementation of PFM crown.

The follow-up period for the three cases was six months and three months, respectively. All the cases were analysed radiographically by two independent examiners according to post and core assessment criteria [2]. Postoperative signs and symptoms were also examined. The volumetric and dimensional accuracy, along with the overall fit, were found to be satisfactory in all cases.

DISCUSSION

Endodontic procedures can alter the internal structure of teeth, potentially leading to increased brittleness and a higher risk of fracture. In young patients, preserving natural teeth is important for their overall development, as tooth loss can negatively impact their

[Table/Fig-5]: Case 2: Final postoperative radiograph showing #11 and #12 after crown cementation.

psychology, nutrition, and facial growth. Extraction and subsequent implant placement may not be ideal treatment choices for adolescents due to ongoing craniofacial growth [3,4]. To withstand masticatory forces, a post may be required in teeth with extensive structural damage before a crown can be placed. The amount of tooth loss and the number of surrounding tooth walls are important deciding factors for post placement. The primary goal of post placement is to ensure the stability of the core material within the tooth [5].

Custom cast metal posts and prefabricated metal or fibre posts are commonly used options in Endodontically Treated Teeth (ETT) for moderate to severe tooth structure loss, as well as abutments for extensive fixed partial dentures and restorations of posterior teeth with inadequate tooth structure [6]. The cast metal post and core are custom-made according to the root canal space and have better compressive strength, thus reducing the chances of separation. They can be adjusted for anterior teeth with single roots of greater width by modifying the anti-rotational projection. The angulation and design can also be altered to create a more convenient crown shape. Additionally, there is limited long-term clinical evidence on the longevity and efficacy of prefabricated posts. Factors influencing the prognosis of teeth repaired with cast posts include post length, taper angle, cement type, and canal fit [7]. The failure threshold of restored teeth is primarily determined by the adaptation of a tapering post to the canal, which, when passively fitted and surrounded by a uniform cement layer, protects the tooth structure from damaging torque and lever forces [7].

To ensure successful custom cast intra-radicular posts, precise recording of the prepared canal space is crucial. Incomplete or void-filled post patterns can lead to prosthesis malfunction. Inlay casting wax, elastomeric impression materials, pattern self-cure acrylic resin, and digital intra-oral scanners are used in conjunction with direct or indirect methods to create post space impressions. The direct procedure involves inserting a prefabricated plastic post into the post space, while the indirect process creates a working cast by imprinting the post space [7].

The success of a post and core restoration hinges heavily on the precision of the fit. A well-fitting post enhances the retention of the core and significantly improves the fracture resistance of the tooth. Post fit can be assessed by analysing the gap between the cast post, the prepared root canal, and any residual gutta-percha [8]. Direct or indirect methods can be used to construct post and core patterns. Direct procedures utilise pattern resin or inlay wax to create

an impression of the post space. Due to its cost-effectiveness, highly detailed reproduction, and simplicity of manipulation, inlay casting wax has long been used for dental castings. Nevertheless, wax can distort during manipulation because of its high coefficient of thermal expansion [9].

Direct fabrication techniques require greater operator skill; however, with more intermediary steps—most of which are outside the dentist's control—the indirect technique's technical challenges may be resolved with the use of acrylic resin [10].

The use of self-cure acrylic resin as an impression medium for post and core restorations in anterior teeth is highlighted in these cases. The advantages and disadvantages of this medium for post and core are shown in [Table/Fig-6] [11,12]. According to the authors, this technique is well-suited for large canals in permanent anterior teeth with a uniform taper.

Advantages	Disadvantages
Self-curing: Less chair side time without any additional curing techniques	Polymerisation shrinkage induced distortion that might lead to distortion
Easy to work with	Monomer leakage
Mouldable in dough stage- can be adapted according to canal shape	Once hardened, cannot be introduced into undercuts or curved canals
Biocompatible	
Inexpensive	
Tasteless	
Good strength	
Shows less thermal variations- favourable to use in the oral environment	
Good viscosity	
High tear resistance	
Records fine details	

[Table/Fig-6]: Advantages and disadvantages of self-cure acrylic resins as impression material for post and core.
Adapted from [11,12]

CONCLUSION(S)

This case series suggests that acrylic resin is a viable option for capturing impressions for post and core restorations in selected anterior tooth cases due to its ease of use, cost-effectiveness, and acceptable accuracy. For a thorough assessment, further studies on long-term clinical results and methods to reduce polymerisation shrinkage and stiffness of acrylic resin are required.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Mar 07, 2025
- Manual Googling: Apr 18, 2025
- iThenticate Software: Jun 10, 2025 (1%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Mar 04, 2025**
Date of Peer Review: **Mar 24, 2025**
Date of Acceptance: **Jun 12, 2025**
Date of Publishing: **Jul 01, 2025**