

# BMJ Bulk-fill composite as intraradicular retention

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## Bulk-fill composite as intraradicular retention in post-endodontic restoration



Yohanna Feter<sup>1</sup>, Tien Suwartini<sup>2\*</sup>, Aryadi Subrata<sup>2</sup>

### ABSTRACT

**Introduction:** The success of endodontic treatment requires not only good-quality root canal treatment but also coronal restoration. The Nayyar core technique used amalgam placement 2–4 mm into the root canal and pulp chamber acting as post and core. Recently there was a development of bulk-fill resin composite for dentin replacement (Smart Dentin Replacement (SDR)) that can be cured up to 4 mm depth with less polymerization shrinkage compared to conventional resin composites. It was discovered that SDR has fracture toughness very similar to sound teeth. The retention of adhesive restoration is micromechanical and does not require macro-retentive feature, leading to less invasive preparation and maximal tooth structure preservation. In addition, it was proven that the use of adhesive material into the canal orifice reduces coronal leakage and increases fracture resistance. Therefore SDR, an adhesive material, will be used in this case report as intraradicular retention.

**Case Illustration:** A 23-year-old female patient came with complaint of spontaneous pain since a month ago on the lower right posterior region. No tenderness on percussion and no mobility observed. Intraoral examination showed a large disto-occlusal caries on tooth 47. Radiographic examination revealed deep caries without periapical radiolucency. Diagnosis of irreversible pulpitis on tooth 47 was made. Root canal treatment was done under rubber dam isolation. SDR was placed 3 mm below the orifice as intraradicular retention. The core was constructed using the same material. The tooth was restored with zirconia crown. At 3 months follow-up, the tooth demonstrated good clinical performance. The patient reported no pain or discomfort during mastication and the tooth can function normally.

**Conclusion:** The post-endodontic restoration successfully returns the form and function of the endodontically treated tooth. The SDR can be considered as a material for intraradicular retention.

**Keywords:** Post-endodontic restoration, minimal invasive, Nayyar core, adhesive restoration.

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### INTRODUCTION

Endodontically treated teeth are at risk of coronal leakage and fracture, which can cause failure of root canal therapy. According to clinical studies, around 11–13% endodontically treated teeth were extracted due to vertical root fracture.<sup>1</sup> This is due to removal of tooth structure during endodontic treatment and loss of dentin moisture. Therefore, the success of endodontic treatment requires both good quality root canal treatment and also coronal restoration that can reinforce residual tooth structure.

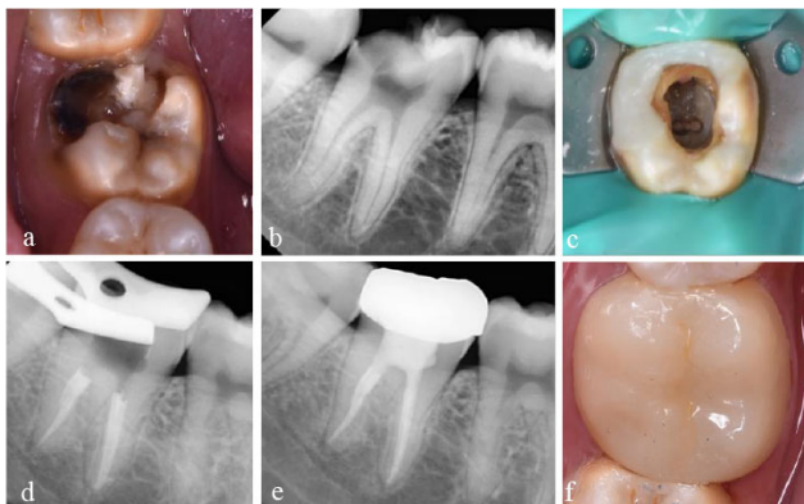
The Nayyar core technique involves amalgam placement 2–4 mm into the root canal and pulp chamber that act as post and core. This technique proved to be effective in endodontically treated tooth.<sup>2</sup> With the development of adhesive restoration material, the retention is now based on micromechanical retention, leading to minimal invasive preparation

and maximal tooth structure conservation. Smart dentin replacement (SDR) is a bulk-fill composite for dentin replacement that can be cured up to 4 mm depth with less polymerization shrinkage compared to conventional resin composites.<sup>3</sup> It was discovered that SDR has fracture toughness very similar to sound teeth. The use of adhesive material into the canal orifice was proved to reduce coronal leakage and increase fracture resistance.<sup>1</sup> In this case report, SDR intraradicular retention in post-endodontic restoration on endodontically treated molar with extensive cavity.

### CASE ILLUSTRATION

A 23-year-old female patient came with complaint of spontaneous pain since a month ago on the lower right posterior region. Intraoral examination showed a large disto-occlusal caries on tooth 47. No

tenderness on percussion and no mobility was observed. Radiographic examination revealed deep caries without periapical radiolucency. Diagnosis of irreversible pulpitis on tooth 47 was made. Root canal treatment was done under rubber dam isolation. All three root canals were prepared biomechanically with copious irrigation using sodium hypochlorite. Final irrigation with activation using sodium hypochlorite and EDTA were done. The root canals were obturated using warm vertical compaction technique using resin sealer. The gutta percha was removed 3 mm below the orifice. The SDR was then placed 3 mm below the orifice as intraradicular retention. The core was constructed using the same material, forming monoblock interphase. The SDR was applied incrementally with the thickness of 3 mm per layer and light cured. The tooth was restored using zirconia crown.



**Figure 1.** (a) and (b) pre-operative, (c) and (d) After obturation, the gutta-percha was removed 3 mm below the orifice, (e) and (f) After placement of SDR for post and core and zirconia crown.

## DISCUSSION

Endodontically treated tooth showed significant reduction in mechanical properties due to caries lesion and endodontic procedure. There is a correlation between amount of remaining tooth structure and its ability to withstand occlusal force. Thus, providing an adequate restoration on endodontically treated teeth is very important to prevent fracture and failure. Nayyar *et al* used amalgam post and core technique which was effective in endodontically treated posterior teeth.<sup>2</sup> In this case report, SDR was used to fill 3 mm into the root canal spaces and pulp chamber to act as a post and core. SDR is non-fiber dentin replacement bulk-fill flowable composite base material with lower polymerization shrinkage and greater depth of cure up to 4 mm. SDR has good adhesive properties and self-leveling properties which improve marginal integrity and adaptation of restorative materials to tooth structure.<sup>4</sup> In addition, SDR is an adhesive material that doesn't require macromechanical retention like amalgam, leading to minimal invasive procedure. It has been demonstrated that the use of adhesive material into

the orifice and root canal, improved the fracture resistance and provide coronal sealing of endodontically treated tooth which is crucial for the success of the endodontically treated teeth.<sup>1</sup> One study showed that the SDR has superior result of pushout bond strength compared to other group that used fiber post with composite flowable and biological post as intraradicular restoration. This might be due to less interphases as it utilizes single material for post and core, forming "monoblock" restoration with mechanical properties similar to tooth structure.<sup>5</sup> Another study showed that SDR showed fracture toughness very close to sound teeth in endodontically treated molar.<sup>3</sup> At three months follow-up, the tooth exhibited good clinical function. SDR can be taken into consideration to be used as material for intraradicular retention in endodontically treated teeth.

## CONCLUSION

The quality of post-endodontic restoration is essential for the success of endodontically treated tooth. The SDR can be used as intraradicular retention in

endodontically treated molar to improved the fracture resistance and provide coronal sealing.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## ETHICAL CLEARANCE

Written informed consent was obtained from the patient involved in this case report.

## FUNDINGS

This case report received no external funding.

## AUTHORS CONTRIBUTION

Yohanna Feter: Writing, reviewing, and editing. Tien Suwartini: Supervision, reviewing, and editing. Aryadi Subrata: Supervision, reviewing, and editing. All authors have read and approved this version of manuscript.

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