Totalfill putty in action

Kazim Mahmood, Obyda Essam, Mike Dodd and Fadi Jarad present case studies that demonstrate the use of a new bioceramic material

Recent advances in endodontics have seen an increase in the use of bioceramic materials. Since its advent there have been a series of sealers, pastes and putties produced as an alternative to zinc oxide eugenol, calcium hydroxide and resin-based systems.

Aims

The aim of this case series is to demonstrate the use of a new bioceramic material (Totalfill putty, Schottlander) to aid endodontic treatment.

This will involve a review of eight cases treated using this material, including a mixture of open apices, resorption defects and retrograde endodontic cases that were completed by a DCT and two endodontic postgraduate students from the restorative department at Liverpool Dental Hospital.

CASE ONE

Figure 1a: Case one – UR1 preoperative

Figure 1b: Case one – UR1 MAP

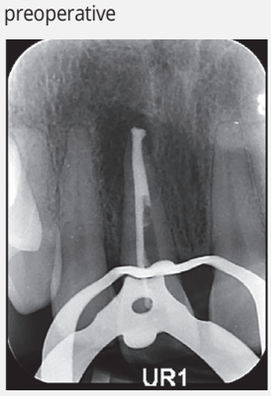


Figure 1c: Case one – UR1 plug

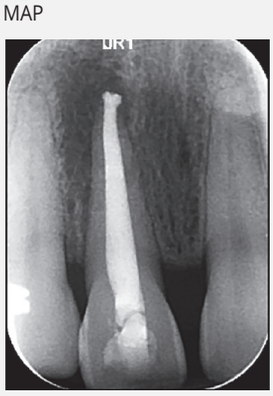


Figure 1d: Case one – UR1 postoperative

Case one: open apex apical plug obturation UR1

A 32-year-old female patient presented with chronic periapical periodontitis affecting her non-vital immature UR1. Preoperative radiographs confirmed the presence of an open apex and a periapical radiolucency (Figure 1a). A Totalfill plug of 4mm was provided followed by GP backfill and a definitive composite restoration (Figures 1b and 1c). There was 1mm extrusion of the apical plug (Figure 1d).

CASE TWO

Figure 2a: Case two – UR2 preoperative

Figure 2b: Case two – UR2 working length

Figure 2c: Case two – UR2 plug

Figure 2d: Case two – UR2 postoperative

Case two: internal root resorption defect UR2

A 16-year-old female patient attended with chronic periapical periodontitis affecting her UR2 with evidence of internal root resorption affecting the apical third of the root canal (Figure 2a). The initial treatment strategy involved obturating the canal conventionally with gutta percha (Figure 2b). This was deemed unsuccessful at follow-up and a decision was made to provide a Totalfill putty apical plug to obturate the resorptive defect with a backfill of gutta percha (Figure 2c). A good quality obturation with minimal extrusion was achieved (Figure 2d).

CASE THREE

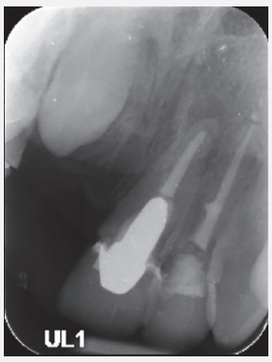


Figure 3a: Case three – UL1 preoperative

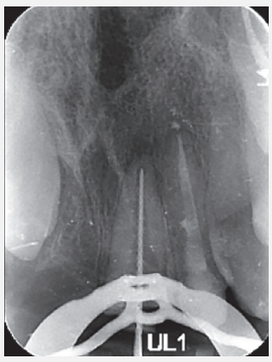


Figure 3b: Case three – UL1 working length

Figure 3c: Case three – UL1 plug

Case three: failed RCT and post crown UL1

A male patient attended with chronic periapical periodontitis, affecting his root canal treated and post-crown UL1 (Figure 3a). A decision was made to attempt to remove the post/crown and provide a re-root canal treatment. The master apical file exceeded 60K and a Totalfill putty plug followed by a backfill GP obturation was provided (Figures 3b and 3c). The plug was well condensed with no extrusion.

CASE FOUR

Figure 4a: Case four – preoperative

Figure 4b: Case four – postoperative

Case four: apicectomy LR1 and LL1

A 35-year-old male attended with chronic periapical periodontitis, affecting his LR1 and LL1 associated with failed root canal treatment (Figure 4a). In light of the good quality endodontic treatment already provided it was decided to provide surgical endodontic treatment with a retrograde Totalfill putty plug on both teeth. The postoperative radiograph confirms the presence of a well-sealed 2mm apical plug in both canals (Figure 4b).

CASE FIVE

Figure 5a: Case five – UR1 preoperative

Figure 5b: Case five – UR1 working length

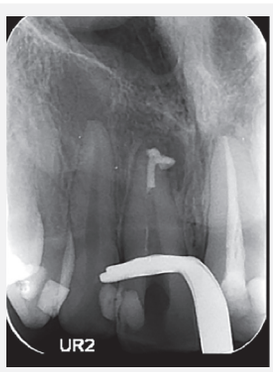


Figure 5c: Case five – UR1 plug

Figure 5d: Case five – postoperative

Case five: open apex apical plug obturation UR1

A 24-year-old male patient presented with chronic periapical periodontitis affecting his non-vital immature UR1. Clinically, the master apical file was 80K at a working length of 20.5mm. A Totalfill plug of 5mm was provided and the remainder of the canal was backfilled with gutta percha (Figure 5c). Unfortunately, there was 2mm extrusion of the apical plug with no postoperative complications (Figure 5d). No symptoms were reported postoperatively.

CASE SIX

Figure 6a: Case six – UR1 preoperative

Figure 6b: Case six – UR1 working length

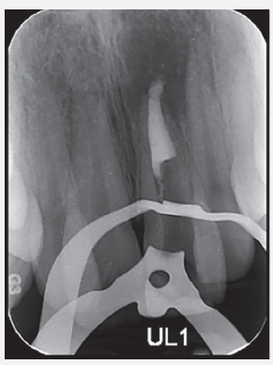


Figure 6c: Case six – UR1 plug

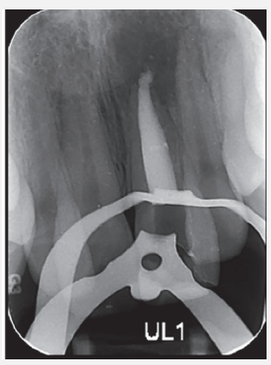


Figure 6d: Case six – UL1 postoperative

Case six: open apex apical plug obturation UL1

A 13-year-old female patient presented with chronic periapical periodontitis, affecting her non-vital immature UL1 (Figure 6a). A Totalfill plug of 5mm was provided under microscopic guidance and the remainder of the canal was filled with injectable gutta percha (Figures 6b and 6c). A coronal seal was provided with Vitrebond and a composite restoration. There was 1mm extrusion of the apical plug (Figure 6d).

CASE SEVEN

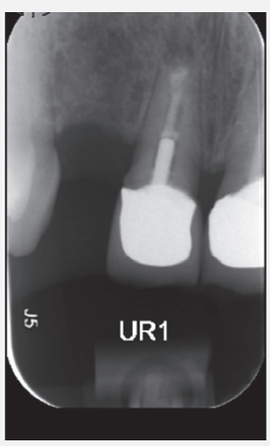


Figure 7a: Case seven – UL1 preoperative

Figure 7b: Case seven – UR1 postoperative

Case seven: failed post crown and re-RCT UR1

A female patient attended with chronic periapical periodontitis associated with a failed post/crown and root canal treatment of the UR1 (Figure 7a). A decision was made to attempt to remove the post crown and perform re-root canal treatment via an orthograde approach. The canal was obturated using Totalfill sealer and thermoplastic gutta percha. The tooth was subsequently restored with a fibre post and replacement crown. The obturation of the root canal system is of a good standard terminating within 1mm of the radiographic apex (Figure 7b).

CASE EIGHT

Figure 8a: Case eight – UR2 preoperative

Figure 8b: Case eight – CBCT sagittal

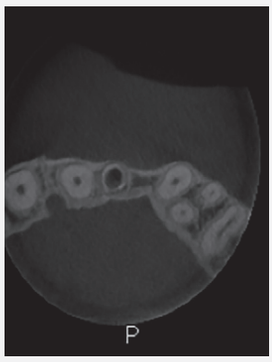


Figure 8c: Case eight – CBCT axial

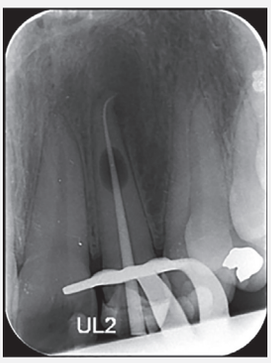


Figure 8d: Case eight – UR2 MAP

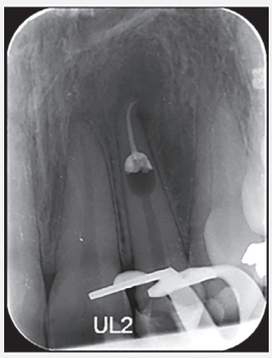


Figure 8e: Case eight – UL2 mid-fill

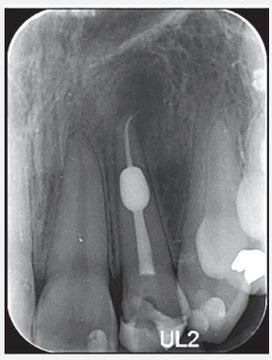


Figure 8f: Case eight – UL2 postoperative

Case eight: internal root resorption defect UL2

An 18-year-old male patient attended with chronic periapical periodontitis, affecting his UL2, which was also suffering from internal resorption in the mid third (Figure 8a). CBCT investigation revealed the extent and position of the lesion (Figures 8b and 8c). Further management involved the provision of root canal treatment with gutta percha obturation with Totalfill sealer used to obturate the resorptive defect (Figures 8d and 8e). The radiographic result confirmed a well-obturated root canal system/defect (Figure 8f).

GROUP A

Figure 9a: MTA crystalline surface

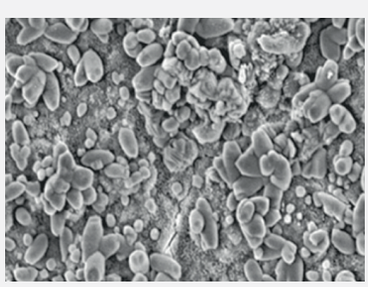


Figure 9b: Totalfill RRM crystalline surface

GROUP B

Figure 10a: MTA fibroblast adhesion

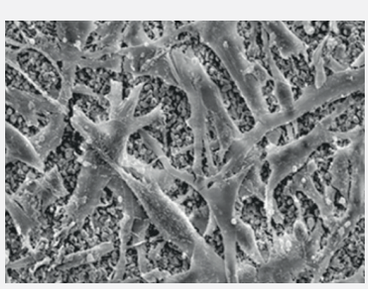


Figure 10b: Totalfill RRM fibroblast adhesion

Figure source: Jingzhi, Shen, Stojicic, Haapasalo, 2011

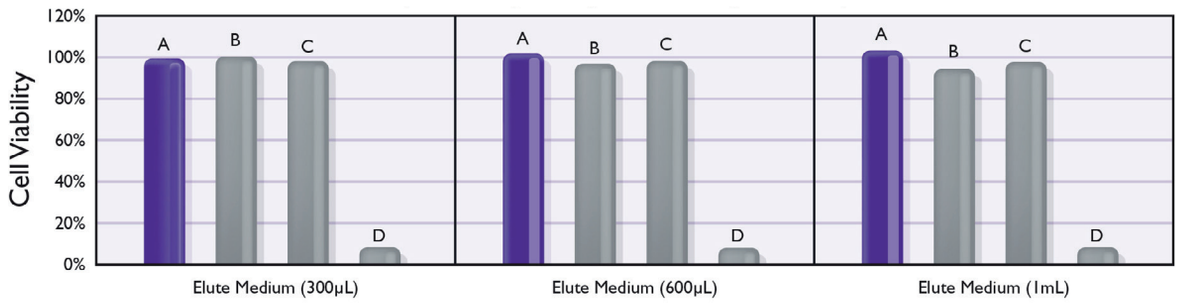
Bioactive

The SEM images illustrate the similarities between MTA and RRM. Group A (Figures 9a and 9b) shows the crystalline surfaces of MTA and Totalfill RRM. Both surfaces are composed primarily of calcium, carbon and oxygen.

More notably, group B (Figures 10a and 10b) shows the extent of human gingival fibroblast adhesion to MTA and Totalfill RRM (after seven days of incubation). Notice the extensive matrix-like overlay on the surface of the RRM.

These SEMs visually confirm that Totalfill RRM is highly bioactive and efficiently promotes biomineralisation.

Table 1: Cytotoxicity comparison three-day set samples



Source: AlAnezi AZ, Jiang J, Safavi KE, Spangberg LSW, Zhu Q. Cytotoxicity evaluation of EndoSequence Root Repair Material. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2010; 109(3): 122-5. DOI:10.1016/j.tripleo.2009.11.028

A = TotalFill® Root Repair Material
B = Gray MTA
C = White MTA
D = AH26®

Biocompatibility

Table one shows the percentage cell viability after application of Totalfill compared to MTA and AH+, highlighting the excellent biocompatibility of the material whereby after three days there was 100% cell viability.

Results and discussion

Totalfill putty from Schottlander consists of calcium silicates, zirconium oxide, tantalum peroxide, calcium phosphate monobasic and fillers. It is provided in a pre-loaded jar, pre-mixed, and can be directly applied. It sets upon exposure to moisture, is insoluble, radiopaque and does not shrink on setting. The working time is up to 30 minutes. Setting time is a minimum of two hours, although it can take longer in extremely dry canals. There is no requirement to add liquid as sufficient moisture is provided by the apical tissues and dentinal tubules. Its consistency is such that it permits manipulation and placement with hand instruments without the need for a carrier unlike conventional MTA materials.

There are several advantages to this material. It has excellent handling characteristics and a shorter setting time than MTA. Its consistency is very much like temporary material Cavit in that it adheres well to hand instruments and is very easy to pack.

Its biocompatibility is similar to that of MTA (Alanezi et al, 2010) and, when set, produces a highly crystalline structure that enhances fibroblast adhesion and subsequent biomineralisation (Figures 9 and 10) (Jhingzhi et al, 2011). Furthermore, during setting, the material produces a pH of 12, creating a highly alkaline and antibacterial environment further facilitating complete disinfection of the root canal system and the sealer variant of Totalfill has been shown to have less microleakage than resin-based systems such as AH Plus (Parwar et al, 2014). Additionally, the omission of heavy metal oxides found in MTA eliminates the risk of tooth discolouration postoperatively.

The main drawbacks are the cost and perhaps the increased risk of apical extrusion in open apices cases. In this case series, there was more evidence of extrusion compared with MTA. The material does require less force to compact into an effective apical barrier and perhaps due to its different handling capabilities coupled with limited operator experience it makes it more likely to be extruded.

Conclusion

The cases treated show evidence that Totalfill is a valuable alternative to existing materials with a wide range of clinical indications and excellent radiographic and clinical results evident through its use. ■

References

Alanezi AZ, Jiang J, Safavi KE, Spangberg LSW, Zhu Q (2010) Cytotoxicity evaluation of Endosequence Root Repair Material. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology*. 109(3): 122-5

Jingzhi M, Shen Y, Stojicic S, Haapsalo M (2011) Biocompatibility of Two Novel Root Repair Materials. *JOE* 37(6): 793-8

Parwar S, Pujar M, Makandar S (2014) Evaulation of the apical sealing ability of bioceramic sealer, AH plus & Epiphany: An in vitro study. *J Conserv Dent* 17(6) 579-582

TotalFill Premixed Bioceramic Endodontic Materials Brochure, FKG Swiss Endo, Brasseler USA Dental

AUTHORS

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