# Clinical application of crosslinked gutta-percha core obturators

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The purpose of this article is to demonstrate the clinical use of crosslinked gutta-percha core obturators for teeth requiring endodontic treatment that present with simple and complex root canal anatomy.

Successful root canal treatment relies not only on proper shaping and disinfection but it also requires a proper three dimensional obturation of the entire complexed root canal system in order to prevent reinfection (Schilder, 1983).

Cold lateral compaction, warm vertical compaction and core-carrier techniques remain the most commonly used endodontic obturation techniques up to date. A study by Li et al (2014) showed carrier-based obturation to have a lower incidence of interfacial gaps and voids compared to warm vertical and cold lateral compaction.

Buchanan (2009) advocates the use of carrier-based obturators in long, narrow and severely curved canals. The flexibility of the carrier allows for obturation of these canals; however, the stripping of the gutta-percha may cause direct contact between the plastic carrier and the dentine wall in curved canals (Leung, Gulabivala, 1994). This problem has been attributed to procedural errors such as improperly shaped canals (Buchanan, 2009).

GuttaCore cross-linked gutta-percha core obturators (Dentsply Sirona) were introduced to overcome these clinical challenges. GuttaCore consists of a carrier/core manufactured from a cross-linked, thermoset elastomer of gutta-percha coated in regular gutta-percha (Figure 8). The core is a polyisoprene polymer cross-linked with peroxide for strength, designed to facilitate removal during retreatment and/or post space preparation by simply trephining through the core (Alhashimi et al, 2012).

Gutmann (2012) recommends that for the GuttaCore material to flow into the canal



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Figure 1: Preoperative periapical radiograph showing the presence of a large composite restoration and an access cavity preparation that extends into the pulp chamber.



Figure 2: An axial slice of a high resolution CBCT scan (Carestream 8100, Carestream) revealed five root canal systems (arrows). Two root canals in the mesial root and three root canals in the distal root.

# CLINICAL





Figure 3: High magnification view of the pulp chamber floor outlining the position of the enlarged canal orifices (MB-mesiobuccal; ML-mesiolingual; DB-distobuccal; MD-middistal,; DL-distolingual).

Figure 4: Length determination periapical radiograph.



Figure 5: The ProGlider single file rotary glide path instrument was used to enlarge the reproducible glide path that was secured with hand instruments.

intricacies the canals should be shaped and enlarged to a minimum of ISO size 25 and a taper of 6%. This is also the minimum size and taper that is recommended for root preparation (Gutmann, 2012; Khademi, Yazdizaheb, Feizianfard, 2006; Paqué, Ganahle, Peters, 2009) to ensure thorough canal debridement (Boutsioukis et al, 2010a; Boutsioukis et al, 2010b).

The purpose of this article is to demonstrate the clinical use of crosslinked gutta-percha core obturators for teeth requiring endodontic treatment that present with simple and complex root canal anatomy.

#### Case report 1:

The patient, a 51-year-old male, presented with spontaneous pain on his mandibular left first molar after an temporary root canal treatment. Clinical examination revealed that the tooth was restored with a large composite restoration. Radiographic examination confirmed the presence of a large composite restoration and access cavity preparation that extends into the pulp chamber (Figure 1). An axial slice of a high resolution Cone Beam Computed Tomography (CBCT) scan (Carestream 8100, Carestream) revealed five root canal systems. Two root canals in the mesial root and three root canals in the distal root (Figure 2). After the administration of local anaesthetic, an access cavity, ensuring straight-line access into all the root canal systems was prepared. Five root canal orifices were located and canal negotiation was initiated with a size 10 K-File (Dentsply Sirona). Coronal restrictive dentine was removed from the canal orifices with a SX instrument from the ProTaper Universal system (Dentsply Sirona), using it in a backstroke cutting motion. Figure 3 shows a high magnification view of the pulp chamber floor outlining the position of the enlarged canal orifices.

Using an alternating combination of size 08 C+ and size 08 K- Files (Dentsply Sirona), the canals were negotiated to patency. A Propex Pixi (Dentsply Sirona) Apex Locator was used to establish working lengths for the five root canal systems and confirmed radiographically (Figure 4).

Initial glide paths were established by moving the size 08 K- File in short amplitude vertical strokes of 0.5-1mm from working length, ensuring removal of restrictive dentine by withdrawing or carving in a clockwise direction as proposed by West (2010). This process was repeated in each canal until the file felt loose at this distance. The same procedure was repeated by withdrawing the file 2mm, 3mm and 4mm from the working length, ensuring that the file felt loose in the canals. The same protocol was followed with a size 10 K-



Figure 6: (a) ProTaper Next X1 and (b) ProTaper Next X2 instruments were used to complete root canal preparation.



Figure 8: The five canals were obturated with size 25 GuttaCore obturators.

Figure 9: Postoperative obturation result. Note the apical curvature in the mesiobuccal root canal systems that were maintained during glide path preparation and root canal preparation with ProGlider and the ProTaper Next instruments.

File. A reproducible glide path was confirmed in each canal, by ensuring that the size 10 K- File could travel freely from 4-5mm from working length to patency, using light finger pressure.

A ProGlider single glide path instrument (Dentsply Sirona), operating at 300rpm and a torque of 4 Ncm, was introduced (Figure 5). The file was allowed to progress and



Figure 7: (a) Size 25 GuttaCore Verifier was used to check the root canal preparation; (b) the fit of the verifiers were confirmed radiographically.

enlarge the secured glide paths up to working lengths in all the root canals.

ProTaper Next X1 and X2 instruments (Dentsply Sirona) (Figures 6a and 6b) were used according to the technique outlined by Van der Vyver and Scianamblo (2013) to complete root canal preparation.

Adequate canal preparation was confirmed when a size 25 nickel titanium hand file fitted snug at working length in all five root canal systems. Five, size X2 GuttaCore Verifiers (Dentsply Sirona) were placed up to the working length in each of the prepared root canals (Figure 7a) and confirmed radiographically (Figure 7b). The five root canal systems were obturated using Pulp Canal Sealer (Kerr) and size 25 GuttaCore crosslinked gutta-percha core obturators (Dentsply Sirona) (Figure 8). Figure 9 shows the final result after root canal obturation.

The clinical procedure of this case can be viewed on the following link or QR code:https://youtu.be/WITfx0SdPt0.





Figure 10: Periapical radiograph of the non-vital maxillary left central incisor with evidence of a small periapical infection around the tip of the root.



Figure 11: Length determination periapical radiograph.



Figure 12: Periapical radiograph confirming the fit of the size 40 GuttaCore Verifier.

#### Case report 2:

The patient, a 40-year-old female, presented with a non-vital maxillary left central incisor with evidence of a small periapical infection around the tip of the root (Figure 10). Length determination was done and confirmed radiographically (Figure 11). Root canal preparation was done with a WaveOne Large 40/08 instrument (Dentsply Sirona). A size 40 GuttaCore Verifier was used to verify the canal preparation as well as the apical extend of the canal preparation (Figure 12). Figure 13 shows the final result immediately after obturation with a size 40 GuttaCore obturator and Pulp Canal Sealer. Figure 14 shows a postoperative periapical radiograph at a five-year follow-up visit. Note the resorption of the excess sealer in the midroot lateral canal as well as at the apical foramen of the root canal system. Complete healing of the periapical infection is also observed on this follow-up radiograph.

The clinical procedure of this case can be viewed on the following link or QR code: https://youtu.be/WITfxOSdPtO





Figure 13: Postoperative result after obturation with the size 40 GuttaCore obturator and Pulp Canal Sealer. Figure 14: A periapical radiograph taken at a 5-year follow-up visit. Note the resorption of the excess sealer in the midroot lateral canal as well as at the apical foramen of the root canal

system. Complete healing of the periapical infection is observed.

#### Case report 3:

A 29-year-old female presented with discomfort on her nonvital maxillary right first and second molars (Figure 15). After access cavity preparation on the first molar, four root canal systems were located. A length determination radiograph revealed severe curvatures in the apical third of the two mesiobuccal root canal systems (Figure 16). After glide path preparation with a WaveOne Gold Glider (Dentsply Sirona) (Figure 17a) the four root canal systems were prepared using a Primary WaveOne Gold instrument (Dentsply Sirona) (Figure 17b). After irrigation the four root canal systems were obturated with size 25 GuttaCore obturators in combination with AH Plus Root Canal Cement (Dentsply Sirona) (Figure 18). At a subsequent visit a root canal treatment was performed on the second molar using the same materials and instruments. Figure 19 depicts a postoperative result after root canal treatment on both maxillary molars.

#### Case report 4:

A 46-year-old female patient presented with a decemented crown on her lower right second molar that form part of a three unit bridge. Figure 20 shows a periapical radiograph of the tooth. After removal of the bridge there was evidence of secondary caries (Figure 21). After removal of the caries, a large pulpal exposure with pulp stones in the pulp chamber was visible (Figure 22).

Following access cavity preparation three root canals were



Figure 15: Periapical radiograph of the non-vital vital maxillary right first and second molars.



Figure 16: Length determination periapical radiograph. Note the severe curvatures in the apical third of the two mesiobuccal root canal systems.



Figure 17: (a) Glide path enlargement was done with a WaveOne Gold Glider; (b) root canal preparation was done with a Primary WaveOne Gold instrument.



Figure 18: Postoperative result after root canal preparation, irrigation and obturation with four size 25 GuttaCore obturators in combination with AH Plus Root Canal Cementin.



Figure 19: Postoperative result after root canal treatment of both maxillary molars. All seven canals were prepared with a Primary WaveOne Gold instrument and obturated with size 25 GuttaCore obturators.



Figure 20: Periapical radiograph of the lower right second molar that form part of a three unit bridge.

located (Figure 23) and length determination was done using a Propex Pixi Apex Locator and confirmed radiographically (Figure 24). Root canal preparation was done with ProTaper



Figure 21: Extensive caries of the remaining tooth structure after removal of the decemented bridge.



Figure 22: After caries removal a pulp exposure was evident with pulp stones in the pulp chamber.

Universal instruments (Dentsply Sirona) and fit of three size 25 GuttaCore Verifiers were confirmed radiographically (Figure 25). After irrigation, the mesial canals were obturated with size 25 GuttaCore obturators and the distal canal with size 30 GuttaCore obturator in combination with AH Plus Root Canal Cement. Figure 26 shows the postoperative result after root canal obturation.

The clinical procedure of this case can be viewed on the following link or QR code: https://youtu.be/LHd3tTnfzyc





Figure 23: Access cavity preparation and location of three root canal systems



Figure 24: Length determination periapical radiograph. Note the apical curvature in the distal root canal system.



Figure 25: Periapical radiograph confirming the fit of the three size 25 GuttaCore Verifiers.



Figure 26: Postoperative result after obturation with three GuttaCore obturators in combination with AH Plus Root Canal Cement.

#### Case report 5:

A 48-year-old male presented with irreversible pulpitis on his maxillary left first premolar. Radiographic examination revealed a previously placed composite restoration very close to the pulp (Figure 27). After access cavity preparation two root canal systems were located. A length determination radiograph showed "S"-curvatures in the buccal and lingual root canal systems (Figure 28).

After glide path preparation with a ProGlider instrument (Figure 29) the two root canal systems were prepared using the ProTaper Gold instruments (S1, S2, F1 and F2) (Dentsply Sirona) (Figure 30) and fit of two size 25 GuttaCore Verifiers were confirmed (Figure 31a). After irrigation the two root canal systems were obturated with size 25 GuttaCore obturators in combination with AH Plus Root Canal Cement (Figure 31b). Figure 32 shows the postoperative result after



Figure 27: Preoperative periapical radiograph. Note the previously placed composite restoration very close to the pulp.



Figure 28: Length determination periapical radiograph.



Figure 29: The ProGlider single file rotary glide path instrument was used to enlarge the reproducible glide path that was secured with hand instruments.



Figure 30: ProTaper Gold (a) S1; (b) S2; (c) F1 and (d) F2 instruments used to complete root canal preparation



Figure 31: (a) The fit of size 25 GuttaCore Verifier was confirmed in the prepared root canals; (b) both root canal systems were obturated with size 25 GuttaCore obturators in combination with AH Plus Root Canal Cement.

obturation and core build-up using Core.X Flow (Dentsply Sirona) and a red X.Post (Dentsply Sirona).

#### Conclusion

In this article the authors illustrate the use of GuttaCore obturation in different challenging clinical scenarios after shaping and disinfection of the root canal system. Operator skill and experience as well as the complexity of the clinical case need to be considered when choosing the ideal obturation technique. Practitioners might find the GuttaCore carrier-based technique a reliable and predictable alternative in obturation compared to cold and warm compaction, both in simple and complex endodontic cases.

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Figure 32: Postoperative result after root canal preparation, irrigation and obturation with two size 25 GuttaCore obturators in combination with AH Plus Root Canal Cement.

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