Guided Endodontic Treatment Using a New Software Approach - Case Report

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Aim

To present a novel approach for root canal localization and preparation using a 3D case planning software (SICAT ENDO) and a guided access approach (SICAT ACCESSGUIDE).

Case Report

A 32 year old female patient was referred with pain and localized swelling on lower right canine. Radiographically and clinically the patient exhibits dentin dysplasia type 1 with short or missing roots (shell teeth) combined with severe enamel hypoplasia and with some aplastic areas as well as periapical translucency (Fig. 2 A and Fig. 3). Access cavity preparation under the microscope was interrupted due to missing landmarks of dentin morphology. CBCT data (Orthophos SL, Dentsply Sirona, Bensheim, Germany) were correlated with an optical impression (CEREC Omnicam, Dentsply Sirona, Bensheim, Germany) using SICAT ENDO (SICAT GmbH, Bonn, Germany) software. A drill path was designed in the software (1,2 mm diameter, 24 mm length) to reach the apical third of the tooth root (Fig 1).
After rubber dam isolation the access cavity was slightly enlarged with a diamond bur to remove enamel overhangs. The guiding splint was correctly placed and the drill guide sleeve was, therefore, exactly located above the canine (Fig. 4). The dentine drill (Hager & Meisinger, Neuss, Germany) was used at 5000 rpm with water spray and intermittent force application of approximately 3.0 N (Fig. 5). This minimal invasive path was regularly irrigated with 5% NaOCl after 2-3 mm progression to remove dentin debris. The dentin drilling ended at a length of 24 mm with a plateau at the entrance of the main root canal system in the apical third of the tooth. The root canal was revealed and negotiated under the microscope with high magnification. Further instrumentation was executed with hand and rotary instruments followed by irrigation protocols with 17% EDTA and 5% NaOCl. Finally the minimally enlarged root canal system was thermoplastically filled with gutta percha in a downpack and backfill procedure. Access cavity was sealed with a fiber post and a composite restoration.

Conclusions

The novel clinical approach using the SICAT ENDO software for planning and the SICAT ACCESSGUIDE for the endodontic access preparation seems to be an efficient and safe alternative to traditional methodologies. Future clinically controlled trials should evaluate (i) the reproducibility of this technique, (ii) the potential of accelerating the total treatment time, and finally and most importantly, (iii) the ability to conserve more crown and root dentin compared to the traditional approach. It is expected that guided endodontics could contribute to minimal invasive dentistry in the future, keeping more teeth for longer time in function(1-5).

Literature

(1) Buchgreitz et al.: Guided access cavity preparation using cone-beam computed tomography and optical surface scans - an ex vivo study. Int Endod J. 2016 Aug;49(8):790-5.
(2) Krastl G, et al.: Guided Endodontics: a novel treatment approach for teeth with pulp canal calcification and apical pathology. Dent Traumatol. 2016 Jun;32(3):240-246.
(3) Zehnder MS, et al.: Guided endodontics: accuracy of a novel method for guided access cavity preparation and root canal location. Int Endod J. 2016 Oct;49(10):966-72.
(4) Shi X, et al. : Novel navigation technique for the endodontic treatment of a molar with pulp canal calcification and apical pathology. Aust Endod J. 2017 Jun 23.
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Fig. 1:
Treatment planning using SICAT ENDO for designing an ideal path to the apical third of the root canal system from the present access opening.

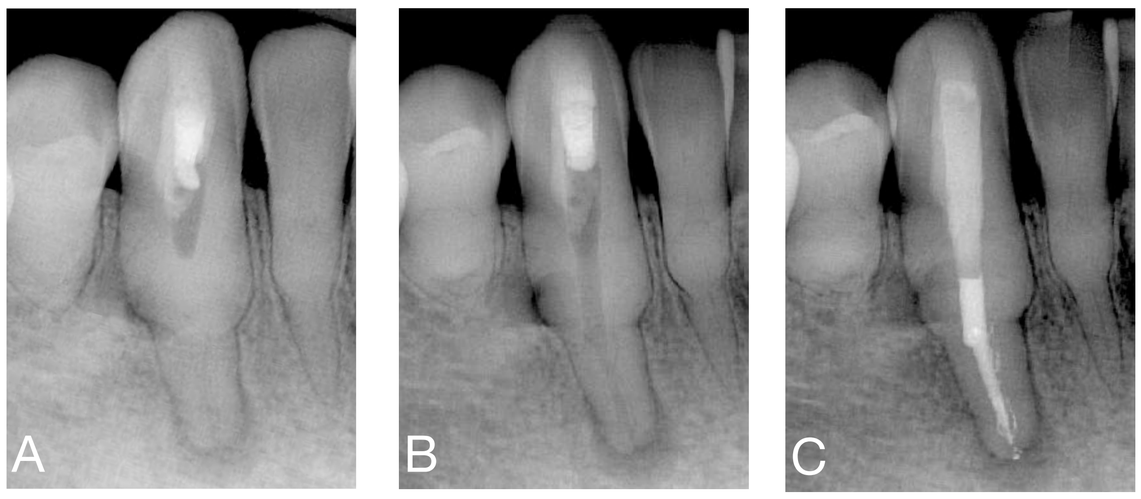

Fig. 2:
Radiographic images after conventional approach (A), after guided approach and root canal instrumentation (B) and after thermoplastical root canal filling (C).

Fig. 3:
Orthopantomographic Rx of dentin dysplasia type 1 with different severity from tooth to tooth; four implants replacing early tooth loss. Red Arrow - periapical radiolucency at canine 43 (Courtesy of referral dentist Dr. Dr. Eric-Peter Franz, Duisburg, Germany).

Fig. 4:
SICAT ACCESSGUIDE splint applied to the isolated dental arch and checked for best fit.

Fig. 5:
Access with the drill guide sleeve to the apical third of the root canal system using a 1.2 mm diameter drill of 24 mm length.