Successful root canal therapy during COVID-19 pandemic

In December 2019, the first case of severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2) was identified at the seafood market in Wuhan, China. It remains a global health threat even after its original outbreak. The last two mutations (i.e., delta and omicron) significantly increased the transmissibility of this zoonotic virus. It has been estimated that omicron could be 10-fold more transmissible than the primary virus type. Lowering the spread of COVID-19 in dentistry requires providing treatments with a low dental aerosol production and offering an appropriate treatment plan for successful root canal therapy (RCT).

As a remote novel technology, teledentistry can be employed to manage dental health care, particularly in deprived areas with no oral specialists. In addition, it can be used for preliminary diagnosis and consultation to avoid unnecessary referrals to dental clinics. This approach may also play a decisive role in reducing the spread of the COVID-19 infection chain. The limitations of this method include the inaccessible palpation and percussion and the poor visualization of the lesion border, especially in the posterior oral cavity. In the case of acute pain (i.e., acute pulpitis), RCT will be required after the remote consultation. Therefore, a safe and effective treatment plan is a priority.

Determination of working length is a prerequisite for successful RCT. Cement–dentinal junction (CDJ) is the best histological landmark in cases that the root canal preparation and obturation are limited in the CDJ. Since CDJ is unrecognizable clinically or through dental X-ray, the apical constriction (AC) is reliable for the apical stop after appropriate access to the cavity. In this regard, a recent review study employed meta-analysis and reported a lack of any significant difference among the 3rd, 4th, 5th, and 6th generations of electronic apex locators when determining the working length. Hence, electronic apex locators can help determine the AC, regardless of generation.

In addition, irrigation solutions play an essential role in optimizing root canal disinfection. The main irrigation solutions used for rinsing the root canal are: 1) sodium hypochlorite (NaOCl), 2) chlorhexidine (CHX), 3) ethylene diamine tetraacetic acid (EDTA), 4) CHX and EDTA (Irritrol), 5) a mixture of tetracycline, acid, and detergents (MTAD), 6) peracetic acid (PAA), and 7) a mixture of CHX, EDTA, and surface-active agent (QMix). Overall, the inability to reach the apical third and remove the smear layer, particularly in the case of a complex anatomical apex (i.e., isthmi and anastomosis), are major issues associated with using irrigation solutions. In this respect, ultrasonic activation and photoactivation methods are helpful to reach the apical area. Besides, the risk of apical extrusion can be avoided by using a negative pressure irrigation system (e.g., EndoVac).

Another unclear question regarding the irrigation solutions is whether the high concentration of irrigation solutions can affect the fracture coefficient of the instrument during RCT.

The following recent studies attempted to address the mentioned issue and reported as follows: Li et al. evaluated the efficacy of various irrigation solutions, including distilled water (control group), 1% and 5% NaOCl, 0.9% NaCl, and 0.2% CHX on the fracture coefficient of ProTaper universal (F1) during root canal preparation. The results showed that the high 5% concentration of NaOCl can affect the F1 files and lead to a fractured instrument. In general, there are two limitations in the study: lack of other rotary file alloys and adaptive motion. In another study, Al-Nasrawi et al. assessed the efficacy of 0.002% and 0.35% PAA on cyclic fatigue of three rotary files, namely One Curve, ProTaper Gold, and Wave One Gold. The results indicated that 0.35% PAA could increase the cyclic fatigue of the instrument. In addition, ProTaper Gold showed lower cyclic fatigue of the instrument with 0.002% PAA than the other rotary systems. The study’s lack of other
irrigation solutions can be highlighted as its major limitation.\textsuperscript{5} It has also been reported that increased NaOCl concentration affects the hardness of structural dentin and may lead to the dentinal crack formation during RCT.\textsuperscript{7} Therefore, selecting an appropriate irrigation solution concentration must be taken into account to avert failure during the RCT.

Rotation system properties can be considered among the factors affecting the successful RCT. The last two generations of rotary NiTi instruments (i.e., the 4th and 5th generations) have significantly improved the quality of cleaning and shaping with regard to the root canal anatomy. The 4th generation is based on an adaptive motion (i.e., clockwise and counterclockwise rotations) and instruments of this generation showed satisfactory results in cleaning and shaping of the root canal. Reciproc-VDW and Wave One systems are two examples of this generation. The last generation has been produced to develop the offsetting center during instruments rotation. For instance, a unique rectangular cross-sectional design and asymmetrical rotation were applied to the ProTaper Next system. The effectiveness of instruments has increased compared to previous generations, particularly in cutting and removing debris. Other notable systems of the 5th generation are Revo-S-Micro-Mega, One Shape Micro-Mega, and controlled memory files such as HyFelx EDM.\textsuperscript{9}

The adhesion between the root canal wall and the filling material is crucial in achieving a successful outcome in RCT and preventing leakage between them, precisely in the apical third. In this perspective, Saricam et al. evaluated the efficacy of EDTA, Qmix, and Irritrol with Er,Cr:YSGG and diode lasers regarding the push-out bond strength (MPa) of root filling material. The results showed that the activation of irrigation solutions, particularly Qmix, through an Er,Cr:YSGG laser can increase the bonding of filling material to root canal dentin.\textsuperscript{6} Therefore, activating the irrigation solutions with laser technology can increase the roughness of the dentine surface.

The root filling technique can be considered the final factor for a successful RCT. The result of a recent systematic review by Bhandi et al. demonstrated that thermoplastized techniques had fewer voids in the root canal filling.\textsuperscript{9} Moreover, another study evaluated the effect of obturation techniques on root dentinal crack propagation. The results showed no change in the percentage of microcracks by using warm vertical or injectable Gutta-Percha techniques.\textsuperscript{10}

According to the content of this letter, diagnostic, appropriate access cavity, cleaning, shaping, and obturation techniques play decisive roles in optimizing root canal treatment, particularly in the COVID-19 pandemic. As earlier mentioned in this letter, all treatments that generate dental aerosol should be avoided unless they are strictly essential.

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Kaveh Nasiri*
Independent Researcher, Essen, Germany

Karl Thomas Wrbas
Department of Operative Dentistry and Periodontology, Center for Dental Medicine, Oral and Maxillofacial Surgery, Medical Center, University of Freiburg, Freiburg i.Br., Germany
Department of Endodontics, Center for Operative Dentistry and Periodontology, University of Dental Medicine and Oral Health, Danube Private University (DPU), Krems, Austria

*Corresponding author. Independent Researcher, Koenigraetzstrasse, Essen 45138, Germany.
E-mail address: DDS.Nasiri@web.de (K. Nasiri)

Received 11 February 2022
Final revision received 14 February 2022
Available online 21 February 2022