

Press Report

New OTR function promotes safety during endodontic treatments

Innovative function for mechanical root canal preparation

A modular measuring and preparation system with OTR function designed for rotating mechanical root canal preparation was presented at this year's IDS: OTR – or Optimum Torque Reverse – is based on the principle of torque-provoked reversal of the direction of rotation. The special feature of OTR as regards measuring technique is that, contrary to other systems, only a very small angular rotation of the file is needed to control the torque automatically and permanently during the preparation process. This reduces the risk of file breakage and helps preserve the natural tooth substance. Consequently, OTR is a suitable instrument for meeting the requirements of modern endodontic treatments.

Endodontic procedures play an important part in today's dental treatments. They form the backbone of many areas in dentistry because they ensure effective and long-lasting preservation of dental structures. Demographics show that our (dental) patients, whose teeth we strive to preserve as long as possible, are growing older. Root canal preparations challenge both the dentist and the material: the wall of the root canal has to be treated completely, and the root canal has to be shaped adequately for cleaning and subsequent obturation. The apical constriction must be retained; clogging with debris has to be avoided [7]. In addition, aspects of treatment safety, for example, preventing instrument breakage in the root canal and formation of a *via falsa* [3, 19], must be considered. Bearing this in mind, the shape of the access cavity already is decisive when preparing a tooth because it is significant for creating adequate and direct access to the root canals [13, 14, 15, 16] as well as for retaining as much healthy tooth substance as possible and sufficient retention for provisional restoration.

The success of a root canal treatment is also affected by effective infection control and a standardized treatment protocol [5]. Preparation and irrigation/medication throughout the entire working length complement each other. That is why endometric instruments are indispensable today in order to determine the correct length of preparation. Precision is important to obtain an optimally prepared root canal: consequently, using a microscope (or at least loupes with adequate magnification) is just as helpful as using a mechanical endodontic system that is equipped with a (variable) torque limitation function for reasons of safety [1, 2, 18]. Finally, the curve of the canal, the speed during preparation and the torque affect the risk of file breakage [8, 9, 21].

Mechanical preparation with OTR function

Different mechanical preparation systems with different modes of operation are available on the dental market. One device that meets the above-mentioned prerequisites to a large extent is DentaPort ZX Set OTR. The preparation system DentaPort ZX, which has been on the dental market for more than ten years, has a new feature: the OTR function (Optimum Torque Reverse). The OTR function essentially is based on the same principle used in other state-of-the-art endodontic motors: the torque acting on the file is measured automatically and the torque value measured controls the direction of file rotation (= torque-provoked reversal of rotation). However, contrary to other systems, only a very small rotational angle of the file is needed with OTR to permanently control the torque during the preparation process, and this significantly reduces the possibility of file breakage.

Therefore, in practice the file continues to rotate at 180° in the cutting direction. When the torque that was set at the beginning of the treatment is reached, OTR relieves the file by immediately changing the direction of rotation. Following reverse rotation of only 90° (by the way, the system also monitors the torque during reverse rotation), the file again continues in the original direction of cutting.

A reverse rotation of only 90° is important because it ensures that the preparation process is interrupted for a short time only. But what happens if the torque measured after a reverse rotation is still too high? Then OTR causes the file to rotate in the non-cutting direction beyond the initial 90° until it is in a safe state again. In this case, safety comes before saving time.

Since the cutting operation only changes to torque reverse when the torque defined in the torque setting is reached (otherwise the file continues to rotate in the

cutting direction), the file is primarily driven in the cutting direction with OTR and there is coronal debris removal. This is why OTR ensures high cutting effectiveness. According to studies conducted by the manufacturer, about 70% of the canal preparation can be completed with a continuously rotating file, i.e. the file rotates in the reverse direction for about 30% of the entire preparation sequence [11].

Other safety-related features

As far as safety is concerned, the device offers additional automatic and safety functions, for example: the file starts rotating as soon as it enters the root canal and it stops automatically when it is removed from the root canal. In the same way, it stops rotating as soon as it reaches the pre-set reference point. These features support the safety of the preparation process. In addition, the speed has a decisive and proportional influence on the risk of breakage of nickel-titanium files – the slower the speed, the less the risk of fracture [6]. For this reason, OTR operates at 100-500 rpm/min. in three steps.

The internal file electrode is subject to continuous wear. Therefore, it has to be replaced after about 100 hours of operation (rotation time). DentaPort automatically emits a signal when it is time to replace the file electrode. Both the internal and external file electrodes can be replaced easily by the dentist or trained assistants.

Increasing wear of the contra angle is accompanied by friction loss of the gearing mechanism, and this may affect the precision of the torque control. In order to avoid this situation, the friction resistance of the contra angle can be determined with the torque calibration function. Afterwards, the device can be calibrated appropriately.

Supporting minimally invasive treatments

The objective of endodontic preparation treatments is to enlarge and shape the root canal with instruments – however, this should only be done to such an extent that the original course of the root canal is retained and that, although the root canal is shaped to enable cleaning and obturation, no undesired straightening occurs [4, 7, 20]. Particularly curved root canals are a real challenge in this connection. In such cases, using the OTR function is particularly helpful because the file will rotate cyclically in curved root canals: although the friction resistance increases only slightly at the beginning of a strongly curved canal, a reversal in the

direction of rotation already occurs with OTR because of the defensive, low trigger values for the torque. This causes a gentle up and down movement of the file, allowing it to follow the contours of curved canals more easily. In contrast, conventional endodontic motors operate at maximum rpm of up to 360°, which may give rise to ledges during the preparation of curved root canals.

Modular design of the system

The base module of the DentaPort System is an apex locator (DentaPort Root ZX), which, since it is a stand-alone tabletop unit, does not necessarily need another module. It can, however, be expanded with the endodontic motor DentaPort TriAuto OTR (which requires Root ZX) and the polymerization handpiece DP-VL or alternately with the motor handpiece. The advantage of a modular system is that you can adapt the equipment to meet your individual needs. So, for example, the polymerization handpiece simply can be replaced by the motor handpiece. Then dentists can work with a polymerization lamp with a very small head, making it easier to reach the molars (and, for example, the adhesive sealing of the access cavity).

Optimizing the workflow

Optimizing the workflow and the cost effectiveness of treatments (e.g. with respect to preservation of material and treatment time) are two aspects that are becoming increasingly important in dental work today. Against this background, DentaPort ZX Set OTR has the advantage that only one to at most three files are needed for a safe preparation procedure [12]. Furthermore, all customary file systems (with the exception of the RECIPROC system) can be used. The manufacturer explains that not only material but also time is saved because the debris is removed safely, the file can move more easily in the canal and the retention of the original course of the canal all can be achieved in a significantly shorter period of time. Since the motor rotates permanently (until the pressure on the file becomes too high), the preparation process goes quickly. Basically, this is only a subordinate aspect, because time should take second place to quality in endodontic treatments [16, 17]. Nonetheless, the fact that time is saved while maintaining quality is not a negative aspect. For reasons of quality control, it is recommended that the instruments be replaced after having been used six times.

Summary and outlook

The so-called OTR function (Optimum Torque Reverse) was integrated in today's third generation of the endodontic motor DentaPort TriAuto. This feature offers the advantage that OTR – contrary to the instruments available up to now – requires only a very small angular rotation of the file to measure the current pressure. Accordingly, dentists can work with optimized angles of rotation and a reduced risk of file breakage both in the cutting and non-cutting directions of the file.

Anatomic circumstances, correct indications and ideal equipment are important for completing an endodontic treatment successfully. Therefore, a microscope or at least a loupe should be part of an endodontic treatment – however, this has not become standard procedure yet. In particular, endodontic revision therapy and fragment removal are challenges in endodontic treatments. Again, the working steps involved can be optimized with the use of state-of-the-art instruments. Such innovative systems as DentaPort ZX Set OTR help dentists master root canal preparation in the course of root canal treatments.

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