

## OTR – A new standard in mechanical root-canal preparation

Modern endodontics: Optimum Torque Reverse (OTR) minimizes risk of file breakage and is easy on tooth structure

**Teeth are essential for humans. That is why it is very important to preserve them – be it by means of oral hygiene at home or dental therapies. The objective of endodontic treatments also is to preserve healthy tooth structure permanently and to treat it as gently as possible during a treatment. A fundamental step towards ensuring long-term success is that root canals be prepared in an anatomically correct way, including the indispensable chemical and mechanical cleaning of the canal system as well as sealing it adequately afterwards. The three basic elements are measuring, preparation and finishing. Modern combination systems unite these elements in one concept and also feature numerous safety functions that, amongst other things, ensure active protection against file breakage, too. A trendsetter in this field is the innovative OTR (Optimum Torque Reverse) function. It minimizes the risk of file breakage and, at the same time, treats the natural tooth structure with care.**

Endodontic treatments challenge not only the endodontist but also the material: the file in particular is exposed to mechanical forces in the root canal, which, under certain conditions, may result in file breakage. During rotary root-canal preparation, mechanical forces counteract the drive torque of the file in the form of torque, and the ensuing torsion could cause the file to break. In order to minimize the risk of file breakage during an endodontic treatment, state-of-the-art combined measurement and preparation systems (e.g. DentaPort ZX Set OTR, Morita) feature intelligent functions. Some of these functions optimize treatment comfort: for example, an automatic Start/Stop function activates file rotation automatically as soon as the file is inserted in the root canal and stops the rotation again when the file is withdrawn.

## **Intelligent safety functions protect against file breakage**

Functions that limit the torque acting on the file during the treatment provide active protection against file breakage and excessive preparation. Naturally, this could also be achieved “by working with feeling” when carrying out the preparation manually; however, when a preparation motor is used, tactile sensation is lost to a significant extent. State-of-the-art methods with automatic control functions measure the (impeding) torque acting on the file and ensure that the file is relieved only when necessary and expedient. Accordingly, the cycle is controlled by the stress, to which the file actually is exposed (reversal of the direction of rotation is provoked by the torque). In DentaPort ZX Set OTR (Fig. 1), for example, the Auto Apical Slow-Down function ensures that the rotation speed is reduced as soon as the file approaches a previously set reference point in relation to the apex; or it stops as soon as this point is reached (Auto Apical Stop) and rotates in the opposite direction (Auto Apical Reverse).

Another possibility is a cyclical reverse motion (opposite to the direction of cutting) by relieving the file periodically according to defined intervals or angles of rotation. The Auto Torque Slow-Down function reduces the rotation speed as soon as the file approaches the defined torque limit or stops the rotation automatically when a defined torque is reached and rotates in the opposite direction (Auto Torque Reverse). The latter method was implemented for the first time in the world in TriAuto ZX (Morita) and later also in DentaPort ZX; other manufacturers introduced this method later in their products. Nonetheless, there are considerable qualitative (e.g. measuring accuracy, speed of the control circuit) and quantitative (e.g. length of measuring intervals, range of reverse rotation of the file) differences in ATR devices. Now Morita’s current DentaPort ZX Set OTR features new technology that is designed to optimize mechanical preparation even more: Optimum Torque Reverse (OTR).

## **OTR – New standard for mechanical root-canal preparation?**

The OTR function, which unites the advantages of the rotating and alternating methods, was integrated in the current, third-generation DentaPort TriAuto OTR

endodontic motor. In combination with the stand-alone basic module DentaPort Root ZX (apex localization) and the LED polymerization handpiece, DentaPort TriAuto OTR can be expanded to form the combination system DentaPort ZX Set OTR. Just like Auto Torque Reverse, Optimum Torque Reverse also is based on the principle of torque-provoked reversal of the direction of rotation: as soon as a defined torque is reached, the file is released by immediately reversing the direction of rotation. When there is no load, the file rotates continuously in the direction of cutting. The Torque Reverse is activated only when the preset torque value is permanently exceeded during 180° forward rotation, and then the file rotates backwards 90° to release itself. Subsequently, it immediately continues rotating in the cutting direction. In contrast to Auto Torque Reverse, the OTR function requires only a small angular rotation of the file to obtain safe feedback about the load; thus, the dentist can predominantly work in the efficient direction of cutting and the file is relieved effectively during reverse rotation. In view of the high cutting effectiveness, it is possible to work at very low drive torque values – compared with Reciproc and Auto Torque Reverse – and at moderate speeds between 100 and 500 rpm.

The optimized rotation angles as well as the defensive torque setting lead to gentle up and down motions of the file in the root canal and improve the movement of the file in the canal. Low drive torques increase the safety and decrease file wear; the endodontist only needs 1 to at most 3 files for a safe preparation session. From an economic perspective, OTR also reduces the time needed for the treatment because fewer file changes are necessary, the file is predominantly driven in the cutting direction and the debris can be removed coronally. Consequently, the advantages of the new function are obvious.

### **Measuring, preparation, polymerization – all in one system**

A significant factor in connection with endodontic therapies is determining the working length of the root canal accurately with the help of modern endometric devices. The length that needs to be determined is defined as the distance between the coronal and apical reference points [1]. This distance can be determined by means of the constant electrical resistance between a mucosal

electrode and a preparation instrument in the root canal. As early as 1994, Morita launched Root ZX, an endometric device that – according to Morita – is still setting the standard for determining the working length. [2] Therefore, the stand-alone apex locator DentaPort Root ZX is the basic module of the DentaPort system. It can be operated without any of the other modules. The device stands out because of its high measuring accuracy – with 97.5% it is the best of its class [3] – and the exact representation of the position of the file on a large color display, including acoustic signals.

DentaPort Root ZX can be expanded with other modules at any time, amongst others with the DentaPort TriAuto OTR endomotor. A new, smaller contra-angle head ensures even better sight, and more working length has been gained by integrating the file electrode in the housing. Finally, the endodontist can complete the adhesive treatment with the LED polymerization handpiece. This instrument also features a small head to ensure good access, and the aspherical lense guarantees deep polymerization without divergence losses. The high-performance lamp can be controlled manually or with a foot pedal.

## **Conclusion**

Because of its modular design, DentaPort ZX Set OTR always is the device that is needed at any precise moment – for reliable measurements, safe and gentle root-canal preparation, and comfortable finishing. In addition, to the latest generations of files, customary product ranges also can be used. This makes DentaPort ZX Set OTR a universal system for almost all file systems, and the innovative OTR function is setting a new standard for mechanical preparation – both the files being used and the healthy tooth structure are treated gently.

## **Literature**

1. Hellwig E, Klimek J, Attin T. Einführung in die Zahnerhaltung. Urban & Schwarzenberg (1995)
2. Kobayashi C, Suda H. New electronic canal measuring device based on the ratio method. Journal of Endodontics 20, 111–4. (1994)

3. [http://www.morita.com/usa/cms/website.php?id=/en/products/dental/endodontic\\_systems/rootmini.htm](http://www.morita.com/usa/cms/website.php?id=/en/products/dental/endodontic_systems/rootmini.htm)

## Figures



Fig.1: Modular DentaPort ZX Set OTR: Measuring, preparation and polymerization with one system