

Management of Narrow and Curved Canals—Using the Simultaneous Technique

狭窄弯曲根管的处理—同步技术

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Fig. 1 Upper left molar with narrow and severely curved canals. Right: Post-operative radiograph. (Dr. Javier Caviedes-Bucheli)

图1左上颌磨牙的狭窄和严重弯曲的根管。右图: 治疗后。(Dr. Javier Caviedes-Bucheli)



Fig. 2 Upper right premolar with severe curvature in the apical third. Note that apical foramen location and original contour of the canal were maintained. (Dr. Javier Caviedes-Bucheli)

图2 右上颌前磨牙根管在根尖1/3处严重弯曲。注意: 预备保持了根尖孔原有的位置和根管原有的轮廓 (Dr. Javier Caviedes-Bucheli)。



Fig. 5 Lower premolar with 3 canals. Note the smooth tapered preparation of the canals with adequate apical diameters. (Dr. Javier Caviedes-Bucheli)

图5具有3个根管的下颌前磨牙。注意: 光滑的锥形根管预备及合适的根尖直径。(Dr. Javier Caviedes-Bucheli)



Fig. 6 Cross-section of an Mtwo rotary instrument. From: Malagnino VA, et al. 2006.⁽¹³⁾

图6 Mtwo旋转工具的横截面。摘自Malagnino VA, et al. 2006。⁽¹³⁾



Fig. 7 Upper right molar. Note that original canal anatomy was respected with a smooth tapered preparation and adequate apical diameters. Left: Working length radiograph. Right: Post-operative radiograph. (Dr. Javier Caviedes-Bucheli)

图7右侧上颌磨牙。注意: 保留了根管原有解剖形态, 具有合适的根尖直径的光滑的锥形根管预备。左图: 显示工作长度的牙片。右图: 术后牙片。(Dr. Javier Caviedes-Bucheli)

Successful treatment of narrow and curved canals represents one of the biggest challenges in clinical endodontic practice. These canals are unique and difficult to treat.⁽¹⁾ They have an oval shape in 75% of cases,^(2,3) which makes cleaning and shaping difficult in some portions of peripheral canal walls and consequently, contaminated dentin is frequently left in the canal. These limitations could compromise treatment prognosis.⁽⁴⁾

There are some principles that must be followed to successfully treat these canals: a) to maintain the apical foramen in its original spatial location;^(5,6) b) to shape the canal according to its form and diameter;⁽⁷⁾ c) to create straight line access to the site of curvature,⁽⁸⁾ d) to respect the anatomical danger zone in curved canals, e) to enhance the action of irrigants and chelating solutions during instrumentation,⁽⁹⁾ f) to create a continuous tapered preparation to facilitate obturation, and g) to use an instrument that adapts to the original shape of the canal, respecting its anatomy.⁽¹⁰⁾

With the development of nickel-titanium rotary instruments, efficiency in shaping procedures has been enhanced due to its higher flexibility when compared to stainless steel instruments^(11,12) and to a higher cutting efficacy when used with electric motors. Mtwo rotary instruments (VDW, Munich, Germany) have unique features that facilitate the clinical management of narrow and curved canals (Fig. 1).

The purpose of this article is to analyze the characteristics of Mtwo rotary instruments and their ability to fulfill the principles described to achieve the successful management of nar-

row and curved canals using the Simultaneous Technique.

Apical patency during the entire shaping procedure is necessary to maintain the apical foramen in its original spatial location.⁽¹⁴⁾ Patency should be achieved using a size 10 or 15 manual K-file.^(15,16)

The Mtwo rotary system includes small diameter rotary files with greater tapers (size 10/0.04 and size 15/0.05),⁽¹⁷⁾ which allow it to work from the beginning with the same working length while maintaining the original canal shape (Fig. 2), also known as the Simultaneous Technique. The instruments have a non-cutting rounded guiding tip, which reduces the creation of zip and elbows, and stabilizes the instrument inside the canal, maintaining the apical foramen in its original spatial location. Their design presents sufficient space between cutting blades and a variable helical angle, especially in the coronal portion of the instrument (Fig. 3), which allows it to efficiently remove dentinal debris during shaping procedures, avoiding the compaction of debris in the apical third.^(18,19)

It is important to enlarge the apical third according to the diameter of the apical foramen and its anatomical shape. It has been shown that most apical foramen possess a diameter between 0.35 and 0.40mm. This anatomic consideration makes it necessary to enlarge the apical portion of the canals up to a file 35 or 40.^(2,7) Mtwo rotary instruments are available in sizes 35 and 40 with 0.04 taper, which have diameters that correspond to most apical foramen sizes. The system also has files with progressive tapers, from a size 10/0.04 to a size 25/0.06, allowing an easier transition between them, as the tip size of

狭窄弯曲根管的治疗是根管治疗中最大的挑战之一。这些根管很独特并且治疗困难⁽¹⁾。其中75%为卵圆形^(2,3), 使根管壁某些部分的冲洗和塑性变得困难, 结果常常导致感染牙本质残留在根管内。这些都会影响治疗预后⁽⁴⁾。

对于这样的根管, 要想治疗成功, 必须遵循以下原则: a) 保持根尖孔在原有的位置^(5,6); b) 根据根管的形状和直径来塑形⁽⁷⁾; c) 创建到达弯曲部位的直线入路⁽⁸⁾; d) 小心弯曲根管的解剖危险区; e) 制备时注重冲洗和整合剂的使用⁽⁹⁾; f) 制备出光滑的锥形根管, 以利于充填; g) 根据解剖结构, 选择适应根管原始形状的预备工具⁽¹⁰⁾。

随着镍钛旋转工具的发展, 根管塑形效率大大提高。这是因为镍钛旋转工具的弹性高于不锈钢工具^(11,12); 此外, 与电动马达合用可明显提高切割效率。Mtwo旋转系统 (VDW, Munich, Germany) 的特有性能利于狭窄弯曲根管的临床处理。(图1)

本文目的是分析Mtwo旋转系统的特性, 及其能否满足上文所述使用同步技术成功预备狭窄弯曲根管的原则。

在整个制备过程中, 根尖开放对于保持根尖孔原有的位置非常必要⁽¹⁴⁾。根尖开放应用使用10或15号手工K-锉来完成^(15,16)。

Mtwo旋转系统包括直径小而锥度大的旋转锉 (10/0.04和15/0.05)⁽¹⁷⁾, 这样可以自始至终使用相同的工作长度, 同时保持原有的根管形状 (图2), 这种技术也被称作同步技术。

这套工具有一个无刃圆性引导头, 可以减少台阶的形成, 并保持根管内的工具稳定, 进而维持根尖孔原有的位置。Mtwo旋转系统的切刃间距足够大, 螺旋角可变, 尤其在工具的冠部 (图3), 因而可以有效地去除牙本质残渣, 避免了其在根尖1/3部位的堆积^(18,19)。

重要的是根据根尖孔的直径及其解剖形状扩大根尖1/3。绝大多数根尖孔直径在0.35mm到0.4 mm之间, 从解剖结构来说, 需要使用最大35到40号锉来扩大根尖部分根管^(2,7)。Mtwo旋转系统含有锥度为0.04的35号和40号锉, 与大多数根尖孔的大小匹配。该系统还包括递增锥度的锉, 从10/0.04号到25/0.06号, 方便锉之间的过渡, 因为下一把锉的尖端直径即前一把锉的前阶直径⁽²⁰⁾ (图4)。这一特点非常有用, 特别是较小型号的锉, 这可确保根尖形状与根尖孔大小一致 (图5)。

狭窄弯曲的根管的卵圆形状使根管壁的冲洗和塑形困难, 可遗留50%的根管壁制备不充分⁽⁴⁾。Mtwo旋转系统具有S形横截面, 可以扩大并保持根管的卵圆形状 (图6)。此外, 双接触点和正前角提高了切割能力⁽²¹⁾。该工具还有一个较细的轴心, 进一步增加了工具的柔韧性, 使之可用于刷洗动作, 通过侧壁施压获得所需的环形根管⁽²²⁾。

Mtwo旋转工具槽长21mm⁽²²⁾, 并具有锉与锉之间锥度递增及可选择性环周锉磨操作等特点。利用Mtwo旋转工具, 在制备出良好的冠部形状的同时, 无需改变根管原有的形状就可逐步扩大根尖1/3部分, 创建出直达根尖的直线入路, 从而实现狭窄

Product Information 产品信息:

Mtwo rotary instruments by VDW Munich Germany are available in sizes 35 and 40 with 0.04 taper. The system also includes files with progressive tapers from a size 10/0.04 to a size 25/0.06.

德国慕尼黑VDW生产的 Mtwo旋转工具有锥度为0.04的35号和40号工具。同时还提供自10/0.04号到25/0.06号的递增锥度的锉。



Fig. 3 The variable helical angle and the progressive pitch of Mtwo rotary instruments allow an efficient debris removal. The non-cutting guiding tip stabilizes the instrument inside the canal.

图3 Mtwo旋转工具的可变螺旋角和递增的螺距便于有效地清除残渣。无刃圆形引导头可保持根管内的工具稳定。



Fig. 4 Complete set of Mtwo instruments. From left to right: 10/.04, 15/.05, 20/.06, 25/.06 (Basic set), 30/.05, 35/.04, 40/.04, 25/.07 (accessory files). Note the progressive taper in the basic set where the tip size of the next file corresponds to the D1 diameter of the previous file.

图4 全套Mtwo工具。从左到右: 10/.04, 15/.05, 20/.06, 25/.06 (基本配置), 30/.05, 35/.04, 40/.04, 25/.07 (附加锉)。注意基本配置的渐进式锥度, 下一把锉的尖端直径即前一把锉的前阶直径。

the next file corresponds to the D1 diameter of the previous file (Fig. 4).⁽²⁰⁾ This feature is helpful, especially in smaller size files, and guarantees apical shaping according to foramen size (Fig. 5).

Oval shape in narrow and curved canals also makes cleaning and shaping procedures difficult circumferentially, leaving up to 50% of canal walls underprepared.⁽⁴⁾ Mtwo rotary files are capable of enlarging and maintaining these oval shapes due to their "S" cross sectional design (Fig. 6), with two contact points and a positive rake angle which provide increased cutting ability.⁽²¹⁾ They also have a reduced central core which increases instrument flexibility and allows them to be used in a brushing motion, exerting lateral pressure to obtain a selective circumferential shaping.⁽²²⁾

Mtwo rotary instruments used have a 21mm flute length⁽²²⁾ which, together with the progressive taper between files and the selective circumfer-

ential filing motion, generate a coronal convenience form while progressive enlarging the apical third without modifying the original shape of the canal, creating a straight line access to the apical portion and fulfilling one of the most important principles in the management of narrow and curved canals.⁽¹⁰⁾ This feature reduces instrument stress and subsequently minimizes the possibility of separating an instrument. Moreover, it allows the irrigant and chelating solutions to exert their functions from early phases of root canal preparation.⁽²³⁾ Another advantage of the brushing motion is to respect the danger zone of curved canals by pushing the file toward the safety zone during circumferential filing. This allows the instrument to selectively cut and remove the dentin that is necessary to reach the apical third without weakening the root,⁽²²⁾ maintaining the original shape of the canal, while obtaining a smooth, tapered preparation ideal for obtura-

tion (Fig. 7).⁽²⁴⁾

As a final consideration, the Mtwo rotary system allows the instruments to adapt to the contour of the canals and because of the single length technique (aka the Simultaneous Technique) and its selective circumferential filing, it respects the original canal anatomy. This constitutes the major difference with rotary systems that are based on a crown-down approach, which modifies the oval shape of the severe curved canals into a round shape.⁽²⁵⁾

In conclusion, the selection of a rotary system should be made according to the anatomy of the canal, taking into consideration the characteristics of each system and its ability to fulfill the endodontic principles of the management of narrow and curved canals.⁽¹⁰⁾ Mtwo rotary instruments have shown excellent results with respect to the aim of this study. APDN 58

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