

# 机用 ProTaper 进行恒磨牙根管预备的临床评价 \*

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**摘要** 目的:评价机用 ProTaper 镍钛根管器械进行恒磨牙根管预备的临床疗效。方法 2007 年 7 月至 2010 年 12 月期间就诊的需进行根管治疗的 109 患者,共计 128 颗磨牙,包括牙髓炎 54 颗牙,慢性根尖周炎 74 颗牙。按随机配对原则分入实验组和对照组,每组 64 颗牙。实验组用机用 ProTaper 镍钛根管锉预备根管,对照组用不锈钢 K 型锉预备根管。两组均采用侧向加压法充填根管,记录每颗患牙的单个根管预备所用时间、根管充填效果、术后不良反应及随访到的远期疗效。结果 机用 ProTaper 镍钛器械预备单根管所耗时间明显少于对照组,根管预备后疼痛发生率明显低于对照组,根管适充率实验组明显优于对照组,根管治疗术后 1 年疗效比较也优于对照组。结论 使用机用 ProTaper 器械进行恒磨牙根管预备快速有效,根充效果好,并发症发生率低,远期疗效确切,值得临床推广。

**关键词** ProTaper 机用器械 根管预备 根管治疗 磨牙 疗效

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## Clinical Evaluation on the Preparation of Molar Root Canals with ProTaper Rotary Instruments\*

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**ABSTRACT Objective:** To evaluate the quality of molar root canal preparation using ProTaper rotary instruments. **Methods:** From July 2007 to December 2010, 109 adult patients with 128 affected molars who were diagnosed to receive root canal treatment were divided into two groups based on the randomly-paired principle. There were 64 teeth in each group. In group A, root canals were prepared with rotary ProTaper files in crown-down mode and in group B root canals were prepared with traditional stainless steel K files by hand. All root canals were obturated with lateral condensation method. The time consumed in preparation of each canal was recorded. The outcome of root filling and side effects occurred after the operation were also noted. 1 year later all the cases were revisited and the therapeutic results were verified. **Results:** Time consumed in the preparation of group A was significantly less than group B. Exact filling rate of canals prepared with rotary ProTaper files was higher than with k files and side effects after the operation such as tooth ache and swelling less occurred. One year post operational follow-up survey showed better therapeutic effects of root canal treatment in the group using rotary ProTaper files. **Conclusion:** Compared with instrumentation with traditional stainless steel K files by hand, molar root canal preparation with rotary ProTaper files is less time consuming and more convenient. The occurrence of side effects was less and the outcome of root filling was more satisfactory.

**Key words:** Rotary ProTaper file; Root canal preparation; K file; Molar

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### 前言

根管治疗术(root canal therapy, RCT)是治疗牙髓病、根尖周病的一种最常用和最有效的方法,由根管预备、根管消毒、根管充填三个步骤组成,其中根管预备是根管治疗术成功与否的最关键步骤<sup>[1]</sup>,它是消毒、充填步骤的基础和前提,根管治疗术成功与否很大程度上取决于根管预备的质量,其基本要求是在保持原有根管系统形状下扩大根管,根管预备应达到的目标是:①形成连续的锥度;②使根管最宽处位于根管口,最窄处位于根尖牙本骨质界处;③保持根尖孔的位置。机用 ProTaper 镍钛器械具有优良的切削能力和根管成形能力并且清理效果

好<sup>[2]</sup>。现将该器械与传统手用不锈钢 K 锉进行对比,以评价机用 ProTaper 镍钛器械的临床应用效果。

### 1 材料与方法

#### 1.1 病例选择

以 2007 年 7 月至 2010 年 12 月期间在我院口腔科就诊的患者为研究对象。纳入标准 ①患牙为第一或第二磨牙并且被诊断为急、慢性牙髓炎或慢性根尖周炎,需进行牙髓治疗,但无牙髓治疗史 ②X 线牙片显示根周及根尖有骨密度减低,硬板全部或部分消失等不同程度病变 ③知情同意。排除标准 ①严重全身性或系统性疾病患者。②牙槽骨吸收超过根长二分之

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一的牙周炎患牙。按此标准选择 109 例 128 颗牙,男性 57 例,女性 52 例,年龄 18-74 岁,平均 32 岁。包括牙髓炎 54 颗牙,慢性根尖周炎 74 颗牙。将牙位相同、年龄相近、诊断相同且术前 X 线片示根管形态类似的患者按随机配对原则分入实验组和对照组,实验组采用机用 ProTaper 预备根管,对照组采用不锈钢 K 锉预备根管,每组 64 颗牙。

1.2 治疗材料与器械

G 型扩孔钻、机用 ProTaper 及不锈钢 K 锉均为 Dentsply 公司(美国)产品,Raypex-5 型根尖定位仪(VDW 公司,德国);必兰根充糊剂(Satelec 公司,法国),驱动系统为 Endo-it 电动马达(VDW 公司,德国),16:1 减速手机(NSK 公司,日本)。

1.3 治疗方法

124 颗患牙均在术前摄 X 线片,了解根尖周病情况以及根管情况。常规去腐,开髓充分显露髓腔,用 8# 或 10# 锉通畅根管,确定根管口位置、数目、弯曲度及通畅情况。G 型扩孔钻敞开根管上段,根尖定位仪结合 X 线根尖片确定根管工作长度。实验组 64 颗牙采用机动 ProTaper 按照驱动马达内预设的扭矩值和转数预备根管,开启自动停止及反转功能,预备方法为冠向下深入法<sup>[3,4]</sup>。对照组 64 颗牙采用不锈钢 K 锉逐步后退法行预备根管,根管预备至比初锉大 2-3 号。两组病例在根管预备过程中配合使用 15%EDTA 疏通润滑根管以及使用 3%过氧化氢液和 0.9%生理盐水各 5ml 冲洗根管。完成根管预备后,均采用牙胶尖加糊剂侧向加压力充填根管<sup>[5,6]</sup>。以上步骤均由同一医生完成。术后 3d 复查术后疼痛发生情况。12 个月复查,检查患牙有无松动、叩痛、窦道,根尖及粘膜有无红肿并摄 X 线片。

1.4 疗效标准

1.4.1 术后疼痛反应 参照 Negm 标准<sup>[7]</sup>将疼痛分为 4 级:1 级,完全无疼痛;2 级,轻微疼痛,不影响咬合与进食;3 级,中度疼

痛,影响咬合;4 级,严重疼痛,不能咬合,甚至肿胀。3-4 级评为有疼痛。

1.4.2 根管预备效果的评价 根据治疗前、中、后 x 线片,由 2 名不了解分组情况并且临床经验丰富的医师医生阅片和参与评价并记录器械折断与工作长度的改变情况,评价标准<sup>[8,9]</sup>:(1)好:根管形态为冠方大、根端小的连续锥形、无根管偏移,呈好的锥度和流畅度;(2)差:根管走向改变,有台阶形成,锥度及流畅度差。远期疗效评定<sup>[10]</sup>:(1)成功:无症状和体征,咬合功能正常,X 线片显示根充严密合适,尖周透射区消失,牙周膜间隙正常或根尖周透射区缩小,密度增加。(2)失败:X 线片显示根尖周透射区变化不大,或有较明显症状和体征,不能行使咀嚼功能、X 线片显示根尖周透射区变大或原来尖周无异常者出现了透射区。

1.5 统计学处理

采用 SPSS 12.0 统计软件包进行统计处理,检验水准 P=0.05。

2 结果

机用 ProTaper 镍钛器械预备根管,能很好地维持根管的弯曲度和走向,根管的锥度和流畅度极佳,无根管偏移、根尖阻塞、台阶形成(图 1)。无论牙髓活力如何,各年龄组的单个根管预备时间实验组均明显少于对照组,而且随着年龄增长完成根管预备所耗时间也延长。死髓牙的根管预备时间要长于活髓牙(表 1)。根管预备后疼痛发生率实验组明显低于对照组,活髓牙组低于死髓牙组,与患者年龄无明显相关(表 2),根管适充率实验组明显优于对照组(表 3),根管治疗术后 1 年疗效比较实验组优于对照组(表 4)。在治疗过程中,治疗组发生器械折断 3 枚,对照组发生器械折断 4 枚,均留置根管内。

表 1 两组根管预备时间比较[平均预备时间(根管数)]

Table 1 Comparison of time costed in root canal preparation between two groups[mean time(number of canals)]						
	18-44		45-59		60 岁以上	
	活髓牙 Teeth with vital pulp	死髓牙 Teeth with necrotic pulp	活髓牙 Teeth with vital pulp	死髓牙 Teeth with necrotic pulp	活髓牙 Teeth with vital pulp	死髓牙 Teeth with necrotic pulp
PT△	6.4± 0.8, (33)	6.7± 0.7,(38)	7.4± 1.3, (37)	8.5± 2.7, (47)	10.6± 2.1, (16)	13.3± 3.4, (32)
K	9.7± 0.5, (32)	11.1± 1.7, (37)	11.3± 1.8, (36)	12.1± 3.1, (46)	14.7± 3.5, (17)	17.5± 3.9, (31)

注:△PT 组与 K 组间比较 P<0.05,各年龄组间比较 P<0.05,活髓牙组与死髓牙组间比较 P<0.05  
Noet: Comparison of time costed in root canal preparation between PT and K group, P<0.05; comparison of groups of different age, P<0.05; comparison between group of teeth with vital pulp and of teeth with vital pulp, P<0.05

表 2 根管预备后疼痛发生率比较(发生疼痛牙数 / 治疗牙数)

Table 2 Comparison of occurrence of tooth ache after root canal preparation between two groups(number of aching teeth /number of teeth treated)						
	18-44		45-59		60 岁以上	
	活髓牙	死髓牙	活髓牙	死髓牙	活髓牙	死髓牙
	Teeth with vital pulp	Teeth with necrotic pulp	Teeth with vital pulp	Teeth with necrotic pulp	Teeth with vital pulp	Teeth with necrotic pulp
PT△	1/10	1/12	0/12	2/15	0/5	1/10
K	1/10	3/12	2/12	4/15	1/5	2/10

注:△PT 组与 K 组间比较 P<0.05,各年龄组间比较 P>0.05,活髓牙组与死髓牙组间比较 P<0.05  
Note: Comparison of occurrence of tooth ache after root canal preparation between PT and K group, P<0.05; comparison of groups of different age, P>0.05; comparison between group of teeth with vital pulp and of teeth with vital pulp, P<0.05

表 3 根管适充率比较表  
Table 3 Comparison of exact root filling rate between two groups

	18-44		45-59		60 岁以上	
	活髓牙 Teeth with vital pulp	死髓牙 Teeth with necrotic pulp	活髓牙 Teeth with vital pulp	死髓牙 Teeth with necrotic pulp	活髓牙 Teeth with vital pulp	死髓牙 Teeth with necrotic pulp
PT△	93.2%	92.7%	89.6%	88.9%	85.4%	84.3%
K	81.4%	82.1%	79.1%	78.8%	75.1%	74.6%

注 :△PT 组与 K 组间比较  $P<0.05$  ;各年龄组间比较  $P<0.05$  ,活髓牙组与死髓牙组间比较  $P>0.05$   
Note: Comparison of exact root filling rate between PT and K group,  $P<0.05$ ; comparison of groups of different age,  $P<0.05$ ; comparison between group of teeth with vital pulp and of teeth with vital pulp,  $P>0.05$

表 4 根管治疗术后 1 年疗效比较(成功率)  
Table 4 Comparison of 1-year post operational therapeutic effect between two groups

	18-44		45-59		60 岁以上	
	活髓牙 Teeth with vital pulp	死髓牙 Teeth with necrotic pulp	活髓牙 Teeth with vital pulp	死髓牙 Teeth with necrotic pulp	活髓牙 Teeth with vital pulp	死髓牙 Teeth with necrotic pulp
PT△	91.4%	90.6%	86.3%	85.1%	81.9%	80.8%
K	78.3%	75.7%	74.5%	73.2%	71.4%	70.7%

注 :△PT 组与 K 组间比较  $P<0.05$  ;各年龄组间比较  $P<0.05$  ,活髓牙组与死髓牙组间比较  $P>0.05$   
Note: Comparison of 1-year post operational therapeutic effect between PT and K group,  $P<0.05$ ; comparison of groups of different age,  $P<0.05$ ; comparison between group of teeth with vital pulp and of teeth with vital pulp,  $P>0.05$



图 1 经机用 protaper 根管预备 根管充填后 X 线片  
Fig. 1 X-ray graph of molars after root canal preparation with protaper and root filling

3 讨论

机用 ProTaper 是一种新型镍钛器械,与其它机用镍钛器械相比,它独特的凸三角形横截面和可变多锥度的设计,有更高的切削力,在根管预备中更好地保持根管的解剖初形,同时

提高预备效率,尤其是弯曲根管的预备<sup>[11,12]</sup>。器械的尖端为半引导尖,既具有一定的切削功能,又能顺着根管形态和走向前进。预备技术是冠根向预备,因镍钛器械具有良好弹性和记忆功,能根管预备和清理效果更良好,即使是弯曲度较高的根管,也极少有根管偏移等并发症的发生。预备后的根管锥度流畅,根管口比用手用不锈钢 K 锉预备的根管口明显敞开,这是 Pro-Taper 机用镍钛器械本身的设计优点决定的。这样有利于预备中的反复冲洗根管,使根管内残余的物质和碎屑能更彻底地冲出,预备根管后根尖反应较小,较少发生疼痛及肿胀,更有利于根管充填。而传统的手用不锈钢 K 锉结合逐步后退法预备根管,由于器械缺乏足够的弹性,在预备根管特别是细小弯曲的根管时,容易发生根管偏移、形成台阶、根尖口敞开甚至根管侧穿<sup>[13,14]</sup>。在根管预备过程中,因采用挫的方式而容易将根管内感染的牙本质碎屑推出根尖孔,从而使发生术后疼痛、根尖肿胀等并发症的几率增高。

本组病例根管内器械分离的比例较低,通常后牙操作视野较模糊、张口度小,可能是后牙较多发生器械折断的原因,根管的弯曲度越大,器械与弯曲处管壁接触时产生的弯曲压力越大,越易产生金属疲劳而致器械折断,这提示我们在根管预备前要认真观察根管的形态、弯曲度、弯曲角度。以往报道机用镍钛器械采用电动马达驱动,在预备根管时手感较差,随着转速的增加,器械折断的几率也会大大增加<sup>[15,16]</sup>。如今随着驱动系统由计算机智能化控制,只要按照预设的扭矩和转数进行预备,以小幅度提拉动作进行预备,达到该设定值会发出警示音,马达停止,再次踩下踏板时,器械反转退出根管。为减小器械的摩擦力,避免根管内碎屑堵塞,应准备足量的冲洗液及润滑剂,可

选用冲洗液有 3%双氧水、生理盐水、次氯酸钠溶液等,使用 10%EDTA 或 Glyde 作为根管润滑剂还可减小摩擦力,及时清理器械上附着的牙本质粉末等。在日常工作中注意养成准确记录使用次数、经常检查器械及时发现器械表面缺陷以及使用正确清洁、消毒方法的习惯,都可以减少器械折断的风险。

综上所述,与不锈钢 K 挫相比,机用 ProTaper 预备恒磨牙根管快速有效,成形效果好,能很好地维持根管的走向和弯曲度,极少发生根管偏移,术后疼痛肿胀等并发症发生率低,远期疗效确切,值得较大范围推广。

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