机用镍钛器械与手用镍钛扩大锉在牙根管治疗患儿的应用效果比较

欧晓丽[1]，施春梅[1]，周 嫣[1]，赵 玮[2]，唐 倩[1]，罗菊芬[1]
（1.广西壮族自治区人民医院口腔科，广西 南宁 530021；2.中山大学光华口腔医院儿童牙科，广东 广州 510055）

摘 要：【目的】探讨机用镍钛器械对牙根管治疗患儿应激反应及治疗效果的影响，分析其可能作用机制。【方法】选择2015年3月-2017年3月行根管治疗术乳牙牙髓病或根尖病患儿60例（60颗牙）为研究对象，采用随机数字表法分为观察组和对照组各30例（30颗牙），对照组采用手用镍钛扩大挫，观察组采用机用镍钛器械，比较两组患儿根管预备效果、应激反应、疼痛程度、填充效果及远期疗效等指标。【结果】观察组根管根治术患儿根管预备时间明显短于对照组（$P<0.01$），根管偏移等根管形态变化发生率6.67%，明显低于对照组26.67%（$P<0.05$）；龈沟液肿瘤坏死因子-α（TNF-α）、白细胞介素-6（IL-6）、白细胞介素-1β（IL-1β）等含量明显低于对照组（$P<0.05$，$P<0.01$）；根管预备中、根管预备后疼痛率均明显低于对照组（10.00% *vs* 33.33%，3.33% *vs* 23.33%，$P<0.05$）；术后1周，观察组患儿恰填率93.33%，明显高于对照组70.00%（$P<0.05$）；随访6个月，观察组根管术成功率90.00%，明显高于对照组66.67%（$P<0.05$）。【结论】机用镍钛器械有助于缓解牙根管治疗患儿疼痛程度，提高临床疗效，可能与抑制手术应激反应有关。

关键词：根管治疗；乳牙；机用镍钛器械；疼痛程度；应激反应
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Comparison of Application Effect of NiTi Rotary Instruments and Hand NiTi Enlarging File in Children with Root Canal Therapy

OU Xiao-li[1], SHI Chun-mei[1], ZHOU Yan[1], ZHAO Wei[2], TANG Qian[1], LUO Ju-fen[1]
(1. Department of Stomatology, The People's Hospital of Guanxi Zhuang Autonomous Region, Nanning 530021, China;
2. Department of Pediatric Dentistry, Guanghua School of Stomatology, Sun Yat-Sen University, Guangzhou 510055, China)
Corresponding to: OU Xiao-li, E-mail: 1244383805@qq.com

Abstract: 【Objective】To study effect of pain and stress response of NiTi rotary instrument for children with root canal therapy, and analyzed possible mechanisms. 【Methods】60 cases (60 teeth) children with Dental pulp disease or root tip disease by root canal therapy from March 2015 to March 2017 were divided into observation group and control group. The control group used Hand NiTi enlarging file, observation group used NiTi rotary instruments, then root canal preparation, stress response, pain, filling effect and long-term efficacy were compared between two groups. 【Result】The observation group root canal preparation time were significantly shorter than control group ($P<0.01$), root canal deviation etc morphological changes (6.67%) was significantly lower than control group (26.67%, $P<0.05$); gingival crevicular fluid TNF-α, IL-6, IL-1β were significantly lower than control group ($P<0.05$, $P<0.01$). In root canal preparation, after root canal preparation, pain rate were significantly lower than control group (10.00% vs 33.33%, 3.33% *vs* 23.33%, $P<0.05$); 1 week after surgery, just fill rate (93.33%) was significantly higher than control group (70.00%, $P<0.05$). Followed up 6 months, root canal success rate (90.00%) was significantly higher than control group (66.67%, $P<0.05$). 【Conclusion】NiTi rotary instruments help to reduce the pain in children with root canal, improve clinical efficacy, May be related to inhibition of surgical stress response.

Key words: root canal therapy; milk teeth; NiTi rotary instruments; pain; stress response
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作者简介：欧晓丽，通信作者，硕士研究生，副主任医师，研究方向：儿童牙科，E-mail：1244383805@qq.com

乳牙牙髓与根尖周病是常见儿童口腔疾病，多由龋病发展所致，会影响患儿早期咀嚼功能，影响继替恒牙发育[1-2]。根管治疗术(root canal therapy)是其主要治疗方法之一，由于手术操作比较复杂，患儿治疗依从性较差，一定程度上会影响到治疗。根管预备是根管治疗术成功的关键，镍钛器械(rotary NiTi instrument)具有良好的弹性和柔软性、能减少根管形变与根尖偏移，被广泛应用于根管治疗术中[3-4]。镍钛器械分为手动型、机动型两种，手用镍钛应用更广，但易造成操作疲劳；机用镍钛锉具有良好的形状记忆功能与抗疲劳性，可有效缩短操作时间。两种比较研究文献报道较多，国内外学者多从根管预备效果、疼痛程度进行比较，尚无对患儿应激反应的研究，难以揭示影响疼痛的内在作用机制。本文采取随机对照研究的方法，探讨机用镍钛扩大管对牙根管治疗患儿应激反应及临床疗效的影响。

1 材料与方法

1.1 研究对象

选择2015年3月-2017年3月行根管治疗术乳牙牙髓病或根尖病患60例(60颗牙)为研究对象，在取得医院伦理委员批准、患儿家属签署知情同意书的前提下，采用随机数字表法分为观察组和对照组各30例(30颗牙)。观察组：男16例(16颗)，女14例(14颗)；年龄4～7岁，平均(5.3±0.6)岁；疾病类型：牙髓炎患牙17颗，根尖周炎13颗。对照组：男17例(17颗)，女13例(13颗)；年龄4～8岁，平均(5.3±0.7)岁；牙髓炎患牙16颗，根尖周炎14颗。两组患儿性别、年龄、患牙类型等资料比较差异无统计学意义($P>0.05$)。

1.2 纳入标准与排除标准

纳入标准：①均为急、慢性牙髓炎或根尖周炎的乳磨牙；②年龄4～8岁；③X线片下牙根未吸收或吸收≥1/3，恒牙胚仍存在，无根分叉病变。排除标准：①伴有全身系统性疾病者；②药物过敏史者；③治疗依从性差者。

1.3 治疗方法

局部麻醉下，常规去龋、备洞、揭除髓顶、拔髓，使用15号K锉清洗并疏通根管。采用VDW电子根管长度测量仪定位测量根尖长度。对照组采用15～35号手用镍钛扩大挫(Maillefer Instruments Holding Sarl)，观察组采用机用镍钛器械(Pro Taper)中开口挫SX预备根冠部，然后用S1、S2镍钛锉到达刚工作长度行根管预备，F1完成根管预备成型，使用生理盐水和H_2O_2消毒液交替冲洗根管，常规根管内封药1周行根管填充，采用日本森田株式会社Vi-tapex糊剂充填根管。所有操作均由同一医生完成。

1.4 观察指标

1.4.1 *根管预备效果* 统计分析两组根管预备时间、根管形态变化。根管形态变化包括根管偏移、根尖拉开、台阶形成、肘部等，根管偏移等评价方法参照郝鸿等[5]文献资料。

1.4.2 *应激反应* 手术前、手术后3 d，采用3M无菌滤纸插入龈沟静置30 s后取出，采用酶联免疫吸附法检测肿瘤坏死因子-α(TNF-α)、白细胞介素-6(IL-6)、白细胞介素-1β(IL-1β)含量。

1.4.3 *疼痛程度* 根管预备中，采用CHEOPS[6]评估患儿疼痛程度，采用0～3分4级评分法；根管预备后3 d，采用Negm[7]评估患儿疼痛程度，分为1～4级，均是分值(等级)越高，疼痛程度越强烈。根管预备以2～3分计疼痛发生率，根管预备后以3～4级计疼痛发生率。

1.4.4 *填充效果及远期疗效* 术后1周，采用X线片评价填充效果，分为恰填(糊剂距根尖< 1 mm)、欠填(糊剂距根尖≥1 mm)、超填(糊剂超出根尖)；随访6个月，参照Pasqualini等[8]评估远期疗效：根管术成功标准：①牙齿无疼痛；②不影响咬合，无松动；③牙龈无萎缩或肿胀；④X线片提示原有病灶已消除，根尖周组织无病变；⑤恒牙胚发育未受影响，发育程度与对侧同名牙齿相近；⑥根管填充糊剂吸收程度与牙根吸收程度几乎一致。

1.5 统计学分析

采用SPSS 21.0软件进行统计学分析，血清炎性因子等计量资料($\bar{x}\pm s$)用独立样本t检验或配对t检验，填充效果等计数资料[n(%)]用卡方检验，$P<0.05$为差异有统计学意义。

2 结 果

2.1 预备效果

观察组根管根治术患儿根管预备时间明显短于对照组($P<0.01$)，根管偏移等根管形态变化发生率6.67%，明显低于对照组26.67%($P<0.05$，表1)。

表1　两组根管治疗患儿预备效果比较

Table 1　Comparison of preliminary effect between two groups　[$(\bar{x} \pm s)$ or $n(\%)$]

Group	n	Preliminary Time/min[1)]	Morphological changes[2)]				
			Root canal deviation	Root tip away	Steps formation	Elbow	Total
Observation	30	10.76 ± 1.43	1(3.33)	1(3.33)	0(0.00)	0(0.00)	2(6.67)
Control	30	17.23 ± 2.14	3(10.00)	2(6.67)	2(6.67)	1(3.33)	8(26.67)

1) $t = 13.960$, $P < 0.001$; 2) $\chi^2 = 4.320$, $P = 0.017$

2.2　应激反应指标

手术前，两组龈沟液TNF-α等含量比较差异无统计学意义（$P < 0.05$）；手术后3 d，两组龈沟液TNF-α等含量均明显低于同组手术前（$P < 0.05$，$P < 0.01$），观察组龈沟液TNF-α、IL-6、IL-1β等含量明显低于对照组（$P < 0.05$，$P < 0.01$；表2）。

2.3　疼痛程度

两组患儿均无重度病例发生，观察组根管预备中、根管预备后疼痛率均明显低于对照组（$P < 0.05$，表3）。

表2　两组根管治疗患儿手术前后龈沟液TNF-α、IL-6、IL-1β含量比较

Table 2　Comparison of TNF-α, IL-6, and IL-1β before and after surgery between two groups　($\bar{x} \pm s$, μg/L, $n = 30$)

Group	Time	TNF-α	IL-6	IL-1β
Observation	Before surgery	5.82 ± 0.74	2.76 ± 0.42	42.30 ± 5.32
	3 d after surgery	2.25 ± 0.36	1.12 ± 0.26	10.56 ± 1.21
Control	Before surgery	5.76 ± 0.80	2.74 ± 0.40	42.25 ± 4.65
	3 d after surgery	3.50 ± 0.46	1.56 ± 0.30	18.36 ± 2.12
t_1, P_1		0.302, 0.568	0.188, 0.624	0.039, 0.921
t_2, P_2		23.761, 0.000	18.185, 0.000	31.864, 0.000
t_3, P_3		13.414, 0.000	12.926, 0.000	25.604, 0.000
t_4, P_4		11.721, 0.000	6.071, 0.010	17.502, 0.000

t_1, P_1: Comparison before surgery between two groups; t_2, P_2: Comparison before and after surgery in observation group; t_3, P_3: Comparison before and after surgery in control group; t_4, P_4: Comparison after surgery between two groups.

表3　两组根管治疗患儿疼痛程度比较

Table 3　Comparison of pain between two groups　[n or $n(\%)$]

Group	n	CHEOPS score				Pain rate[1)]	Negm level				Pain rate[2)]
		0	1	2	3		1	2	3	4	
observation	30	5	21	3	0	3(10.00)	6	23	1	0	1(3.33)
control	30	3	17	10	0	10(33.33)	3	20	7	0	7(23.33)

1) $\chi^2 = 4.812$, $P = 0.014$; 2) $\chi^2 = 5.192$, $P = 0.012$

2.4　填充效果及远期疗效比较

术后1周，观察组患儿恰填率93.33%明显高于对照组70.00%（$P < 0.05$）；随访6个月，观察组根管术成功率90.00%明显高于对照组66.67%（$P < 0.05$，表4）。

3　讨　论

牙髓病根尖周病诱发原因很多，龋病、牙齿外伤、牙齿发育畸形均可导致乳牙牙髓炎与根尖周炎，常用治疗方法包括冠髓切断术与根管治疗术，当牙髓弥漫性炎症或牙髓坏死时，根管治疗术就成为首选方式[9]。根管预备是根管治疗术成功的关键步骤[10]。彻底清洗根底内的分泌物及感染物、保持根管原本的解剖形态是根管预备的必备条件，塑造适宜的锥体和优秀的流畅度不仅利于根管充填，还能延长牙齿的寿命[11]。

传统的根管治疗术采用手用镍钛扩大挫，其缺点为自身锥度小、硬度较大、无法适应根管的形态而弯曲，易对牙根尖部牙本质过度切削，造成侧

表4 两组根管治疗患儿填充效果及远期疗效比较

Table 4 Comparison of filling effect and long-term effect between two groups [n(%)]

Group	Filling effect(n = 30)			Root canal surgery success
	just fill	over fill	super fill	
Observation group	28(93.33)	1(3.33)	1(3.33)	27(90.00)
Control group	21(70.00)	7(23.33)	3(10.00)	20(66.67)
χ^2	5.455	5.192	1.071	4.812
P	0.011	0.012	0.075	0.014

穿或根管偏移等,对根管形态有着难以恢复的损伤[12]。镍钛为记忆金属,具有柔韧性高、弹性模量低、抗磨损与抗扭曲折断的特点,其弹性为不锈钢的2-3倍[13],高弹力可顺应根管形态,对于不同的根管形态有着良好的适应性,超弹性以及合理的设计则可预防控制根管预备中根管偏移、台阶形成、歧坡等根管形态变化[14]。闫亚平等[15]认为,机用镍钛坐可缩短根管预备时间,减少根管偏移等发生率,本文结果类似。Protaper器械SX为根管口扩大器械,使得根管中上部充分展开,提高了预备效率,有利于根管的冲洗和充填。

疼痛是影响牙根管治疗患儿依从性的主要原因,相关研究表明,牙本质碎屑、牙髓坏死组织、根管冲洗液等对根尖孔的刺激是影响疼痛的主要因素[16]。镍钛器械能够减少对组织的扩挫次数,有助于塑造根管的锥度及流畅度、快速排出分泌物和感染物[17]。这也可能是患儿根管预备中、根管预备后疼痛程度明显较低的主要原因。

疼痛是机体受到外界刺激的一种主观不适反应,也是机体炎症程度的一种表现[18]。机体受刺激后将产生非物异性的防御反应,表现为下丘脑-垂体-肾上腺皮质功能的增强,而且与手术刺激强度、持续时间相关。IL-1β可增强神经根与缓激肽的敏感性,有文献报道IL-1在纤维肌痛综合征患者表达水平明显增高[19];IL-6是机体刺激后单核巨噬细胞分泌物,可诱导T细胞抗体产生,刺激肝细胞合成急性期反应蛋白。TNF-α可作用于破骨细胞、纤维细胞,导致牙周软组织损伤,同时能够激活炎症级联反应[20]。相关研究表明,TNF-α、IL-6、IL-1β是反应组织损伤的敏感性指标,能够直接反应应激反应的程度[21-22]。本文研究中,观察组血清TNF-α、IL-6、IL-1β明显低于对照组,与疼痛程度有良好的匹配性,这也可能是术后疼痛程度降低的内在作用机制。

本文结果表明,机用镍钛器械有助于缓解牙根管治疗患儿疼痛程度,提高临床疗效,可能与抑制手术应激反应有关。本文研究局限性:①未对应激反应、临床疗效的动态观察,②缺乏对机用镍肽器械可能作用机制的深入分析,有待于今后展开更多基础研究与临床研究去证实。

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