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T4K 矫治器治疗替牙早期Ⅱ类错合患儿的临床疗效以及预后研究 *

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摘要 目的：研究 T4K 矫治器治疗替牙早期Ⅱ类错合患儿的临床疗效以及预后。**方法：**选取从 2015 年 2 月到 2017 年 3 月在我院接受治疗的 48 例替牙早期Ⅱ类错合患儿进行研究。采用 T4K 矫治器治疗患儿 6 个月，对比患儿治疗前及治疗 6 个月后的模型测量值、X 线头影测量数据以及上面高、下面高、下面高比例，随访 3 年，分析 X 线头颅侧位片的检测数据。**结果：**患儿治疗 6 个月后的前牙覆合值、前牙覆盖值、上牙弓拥挤度、下牙弓拥挤度均较治疗前明显更低，上牙弓宽度和下牙弓宽度较治疗前明显更高，差异均有统计学意义（均 P＜0.05）。治疗 6 个月后患儿的 SNA 角、ANB 角以及 U1-SN 角和覆盖均较治疗前明显降低，SNB 角、L1-MP 角以及 U1-L1 角和下颌平面角均较治疗前明显升高，差异均有统计学意义（均 P＜0.05）。治疗 6 个月后患儿的上面高、下面高以及下面高比例均较治疗前明显增加，差异均有统计学意义（均 P＜0.05）。随访 3 年显示，ANB 角和 L1-MP 角较治疗 6 个月后明显降低（P＜0.05），而 SNB 角、U1-L1 角、下颌平面角、上面高、下面高、下面高比例、覆盖均较治疗 6 个月后明显增高（P＜0.05）。**结论：**应用 T4K 矫治器对替牙早期Ⅱ类错合患儿进行治疗的疗效较好，有利于其康复和预后，值得在临床上给予相应的推广。

关键词：T4K 矫治器；替牙早期；Ⅱ类错合；患儿；临床疗效；预后

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Clinical Efficacy and Prognosis of T4K Appliance in Children with Class-Ⅱ Malocclusion in Early Mixed Dentition*

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ABSTRACT Objective: To study the clinical efficacy and prognosis of T4K appliance in the treatment of children with class-Ⅱ malocclusion in early mixed dentition. **Methods:** A total of 48 children with class-Ⅱ malocclusion in early mixed dentition, who were treated in Shenzhen Hospital of Guangzhou University of Chinese Medicine from February 2015 to March 2017, were selected. The children were treated with T4K appliance for 6 months. The model measured values, X-ray cephalometric data, and above height, below height, below high proportion were compared between the two groups before treatment and 6 months after treatment, followed up for 3 years. The examination data of X-ray cephalometric radiographs were analyzed. **Results:** The overbite value, overjet value, upper arch crowding, lower arch crowding of children after six months of treatment were significantly lower than those before treatment; the upper arch width and lower arch width were significantly higher than those before treatment, the differences were statistically significant (all P<0.05). SNA angle, ANB angle, U1-SN angle and coverage of children after six months of treatment were significantly lower than those before treatment; SNB angle, L1-MP angle, U1-L1 angle and mandibular plane angle were significantly higher than those before treatment, the differences were statistically significant (all P<0.05). The above height, below height, below high proportion of children 6 months after treatment were significantly higher than before treatment, the differences were statistically significant (all P<0.05). After 3 years of follow-up, the results showed that the ANB angle and L1-MP angle were significantly lower than those 6 months after treatment (P<0.05), while the SNB angle, U1-L1 angle, the mandibular plane angle, above height, below height, below high proportion, coverage were significantly higher than those 6 months after treatment (P<0.05). **Conclusion:** The application of T4K appliance in the treatment of children with class-Ⅱ malocclusion in early mixed dentition has better curative effect, and it is beneficial to the rehabilitation and prognosis, which is worthy of clinical promotion.

Key words: T4K appliance; Early mixed dentition; Class-Ⅱ malocclusion; Children; Clinical efficacy; Prognosis

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前言

Ⅱ类错合是指因为口腔不良习惯造成唇舌等口周位置肌肉发生功能异常，或者生长发育出现异常，进而导致替牙早期口腔畸形的一类疾病[1,2]。Ⅱ类错合在临床上十分常见，并且其发病率不断上升，引起口腔正畸医疗工作者的高度重视[3,4]。造成替牙早期出现Ⅱ类错合的主要原因在于下颌骨后缩，同时已有研究证实，通过对下颌骨采取前移措施可以刺激其生长，并且有助于颞下颌关节位置的改建[5,6]。多项报道指出，呼吸方式直接影响下颌骨生长情况，同时对上颌牙弓进行扩大可以增加牙弓宽度，进而改善舌位置的异常症状[7,8]。因此，由口呼吸改成通过鼻呼吸能够促进牙弓宽度扩大，进而改善其前牙位置。有学者提出[9-11]，对于替牙早期Ⅱ类错合患儿应尽早给予正畸治疗，而佩戴矫治器即属于一种正畸疗法。本文通过研究分析T4K 矫治器治疗替牙早期Ⅱ类错合患儿的临床疗效以及预后情况，旨在为临床治疗方案的选择提供相应的数据支持，现报道如下。

1 资料和方法

1.1 临床资料

选取从 2015 年 2 月到 2017 年 3 月在我院接受治疗的 48 例替牙早期Ⅱ类错合患儿进行研究，纳入标准：(1)符合安氏Ⅱ类错合畸形的相关诊断标准[12]；(2)年龄为 6～11 岁；(3)患儿仅为上下 8 颗前牙出现替换，而剩余牙齿尚未替换；(4)未出现前后牙反合。排除标准：(1)其他种类的安氏分类错合畸形者；(2)有颌面部手术史者；(3)随访期间失访者。患儿家长对本研究知情同意，且已签署了同意书。

1.2 研究方法

对所有患儿应用产自芬兰 Cranex Tom 公司的 X 线头颅定位型摄片机为其拍摄好 X 线片的全景片及头颅侧位片，获得记存模型及工作模型，在工作模型中检测信息数据。而后为患儿佩戴 T4K 矫治器，先选择软质矫治器，待初步排齐并整平牙列以及覆合覆盖降低之后，再选择硬质的 T4K 矫治器，调整完善牙位和牙合接触的关系，最后完成矫治治疗。患儿在治疗期间需夜间佩戴矫治器约 9h，白天约 1h，舌头需放在舌尖诱导有关装置上。复诊频率为 1 次 / 月，如有张口呼吸习惯的患儿，因结合耳鼻喉科医生治疗意见消除此习惯。在矫治 6 个月后提取工作模型，并复诊拍摄 X 线片的全景片及头颅侧位片，获得记存模型及工作模型，在工作模型中检测数据，具体数据包含：(1)SNA 角；(2)SNB 角；(3)ANB 角；(4)U1-SN 角；(5)L1-MP 角；(6)U1-L1 角；(7)下颌平面角；(8)上面高；(9)下面高；(10)下面高比例；(11)覆盖。而后随访 3 年，随访结束后再拍摄一次 X 线片的全景片及头颅侧位片，记录检测数据。

1.3 观察指标

对比患儿治疗前、治疗 6 个月后的模型测量值、X 线头影测量数据以及上面高、下面高、下面高比例，随访 3 年，分析 X 线的头颅侧位片的检测数据。

1.4 统计学方法

本文数据利用 SPSS21.0 软件统一处理，计数资料用(%)表示，实施 x^2 检验，而计量资料用($\bar{x}\pm s$)加以表示，实施 t 检验，计量数据差值选用非参数统计法处理，P<0.05 为差异有统计学意义。

2 结果

2.1 患儿治疗前后模型测量值的对比

患儿治疗 6 个月后的前牙覆合值、前牙覆盖值、上牙弓拥挤度和下牙弓拥挤度均较治疗前明显更低，上牙弓宽度和下牙弓宽度较治疗前明显更高，差异均有统计学意义(P＜0.05)，见表 1。

表 1 患儿治疗前后模型测量值的对比(mm, $\bar{x}\pm s$)

Table 1 Comparison of model measurements in children before and after treatment(mm, $\bar{x}\pm s$)

Time	n	Anterior teeth overbite	Anterior teeth coverage	Upper arch width	Lower arch width	Upper arch crowding	Lower arch crowding
Before treatment	48	5.27± 0.68	5.26± 1.21	47.34± 2.18	44.52± 2.51	4.76± 1.68	3.51± 0.46
After 6 months	48	2.23± 0.21	3.02± 0.49	48.77± 2.24	47.03± 3.27	2.02± 0.47	0.51± 0.39
t	-	29.594	11.888	3.170	4.219	10.882	34.464
P	-	0.000	0.000	0.002	0.000	0.000	0.000

2.2 患儿治疗前后 X 线头影测量数据对比

治疗 6 个月后患儿的 SNA 角、ANB 角、U1-SN 角和覆盖均较治疗前明显降低，SNB 角、L1-MP 角、U1-L1 角和下颌平面角均较治疗前明显升高，差异均有统计学意义(均 P＜0.05)，见表 2。

2.3 患儿治疗前后上面高、下面高以及下面高比例对比

治疗 6 个月后患儿的上面高、下面高以及下面高比例均较治疗前明显增加，差异均有统计学意义(均 P＜0.05)，见表 3。

2.4 患儿随访 3 年后 X 线头颅侧位片的检测数据分析

随访 3 年后，ANB 角和 L1-MP 角较治疗 6 个月后明显降低(P＜0.05)，而 SNB 角、U1-L1 角、下颌平面角、上面高、下面高、下面高比例以及覆盖均较治疗后明显增大(P＜0.05)，见表4。

3 讨论

不良口腔习惯和生长发育等因素均会对儿童替牙造成一定影响，进而造成颌面畸形。据统计，替牙早期出现Ⅱ类错合情况越来越多，不但对患者颌面部发育以及咀嚼功能等造成严重影响，同时还影响其面部美观，对患者心理健康产生不良影响，受到社会各界高度关注[13-15]。替牙早期是儿童生长发育重要时期，同时其牙列也正在进行乳恒牙更换阶段，颅面骨骼同样进行着

表 2 患儿治疗前后 X 线头影测量数据对比($\bar{x}\pm s$)

Table 2 Comparison of cephalometric data in children before and after treatment($\bar{x}\pm s$)

Time	n	SNA angle (°)	ANB angle (°)	U1-SN angle (°)	Cover (mm)	SNB angle (°)	L1-MPangle (°)	U1-L1angle (°)	Mandibular plane angle(°)
Before treatment	48	79.63± 2.84	5.72± 1.49	104.63± 6.79	3.13± 1.14	73.86± 1.85	25.03± 4.19	22.17± 4.84	95.93± 6.24
After 6 months	48	78.51± 2.32	4.03± 2.01	100.37± 6.54	1.95± 1.06	75.64± 2.49	26.72± 4.01	24.58± 6.30	99.57± 7.32
t	-	2.116	4.680	3.131	5.252	3.976	2.019	2.102	2.622
P	-	0.037	0.000	0.002	0.000	0.000	0.046	0.038	0.010

表 3 患儿治疗前后上面高、下面高以及下面高比例对比($\bar{x}\pm s$)

Table 3 Comparison of above height, below height, below high proportion of children before and after treatment($\bar{x}\pm s$)

Time	n	Above height(mm)	Below height(mm)	Below high proportion(%)
Before treatment	48	53.23± 3.34	64.31± 4.86	58.78± 2.43
After 6 months	48	55.18± 2.05	66.27± 4.73	63.56± 1.35
t	-	3.447	2.002	11.913
P	-	0.001	0.048	0.000

表 4 患儿随访 3 年后 X 线的头颅侧位片的检测数据分析($\bar{x}\pm s$)

Table 4 Analysis of data of cephalometric radiographs in children after 3 years of follow-up($\bar{x}\pm s$)

Indexes	After 6 months	After 3 years follow-up	t	P
SNA angle(°)	78.51± 2.32	78.54± 2.19	0.065	0.948
SNB angle(°)	75.64± 2.49	78.21± 1.17	6.472	0.000
ANB angle(°)	4.03± 2.01	3.27± 1.37	2.165	0.033
U1-SN angle(°)	100.37± 6.54	100.49± 5.26	0.099	0.921
L1-MP angle(°)	26.72± 4.01	25.38± 2.03	2.066	0.042
U1-L1 angle(°)	24.58± 6.30	26.79± 4.37	1.997	0.049
Mandibular plane angle(°)	99.57± 7.32	101.94± 2.49	2.124	0.036
Above height(mm)	55.18± 2.05	57.29± 2.12	4.957	0.000
Below height(mm)	66.27± 4.73	67.84± 2.55	2.024	0.046
Below high proportion(%)	63.56± 1.35	64.77± 1.09	4.831	0.000
Cover(mm)	1.95± 1.06	2.43± 1.01	2.271	0.025

生长改建[16,17]。因此,如何借助此阶段儿童生长发育迅速的有利条件，采取简单易行的方式对替牙早期内错合畸形进行纠正,是当前正畸医生急需解决的问题。目前临床对于替牙早期发生的Ⅱ类错合通常采取及早预防性阻断矫治治疗,应用较多的是采用功能性矫治器。多项研究证实[18-20],功能性矫治器有助于改善患者前牙覆合覆盖情况,并且对吮指以及咬下唇等多种不良口腔习惯起到改正作用,同时还能够帮助对患者上下颌进行纠正。临床研究发现,以往临床比较常用的功能性矫治器,例如前庭盾以及唇挡等类型制作较复杂,并且需要多次复诊,使用异物感较强,患者通常体现依从性差,不利于推广。有学者指出[21,22],T4K 矫治器对替牙早期Ⅱ类错合疗效较满意。本研究进行深入探讨并总结其疗效和预后情况,旨在为其他正畸医生提供可靠建议。

本文经研究发现,患儿治疗后的前牙覆合值和前牙覆盖值以及上牙弓拥挤度和下牙弓拥挤度均较治疗前明显更低,上牙弓宽度和下牙弓宽度较治疗前明显更高(均 $P<0.05$),与罗祥友等人[23]的报道结果基本相符。提示了治疗后患儿的第一磨牙间的牙弓宽度变宽,且上下牙的拥挤度也有所改善。分析原因可能与 T4K 矫治器具有扩大患儿牙弓宽度及缓解牙列拥挤的效果有关。同时,本文发现,治疗后患儿的 SNA 角和 ANB 角以及 U1-SN 角和覆盖均较治疗前明显降低,SNB 角和 L1-MP 角以及 U1-L1 角和下颌平面角均较治疗前明显升高,且治疗后患儿的上面高和下面高以及下面高比例均较治疗前明显增加(均 $P<0.05$),这提示了患儿经过治疗后的 X 线头影测量数据得到了明显的改善,应用 T4K 矫治器实施治疗后,抑制了患儿的上颌骨生长,同时促使其下颌骨生长。原因主要是 T4K 矫治器改善了患儿的上下颌骨有关矢状向关系,使其上切牙内收,而下切牙因受到矫正力作用有所唇倾,因此覆盖减小,加之下颌朝前下方旋转,因此下面高的比例增大。T4K 矫治器是计算机技术与大量正畸经验的完美结合,该矫治器在正畸治疗时可借助

弹性记忆功能来完成矫治治疗。同时,T4K 矫治器在结构方面具有十分可靠的通用类型牙弓轨道，并且具备中性颌定位部件,二者功能相结合,可有效降低上下颌前牙,并且可缩减覆合覆盖,进而强迫患者下颌向前伸,调节并改善患者矢状关系情况。此外,T4K 矫治器在结构方面还设有唇挡以及加力唇弓和舌挡等类型诱导装置,对纠正改善不良唇舌习惯,以及强迫患者自口呼吸改成鼻呼吸习惯等均有较大帮助。相关研究报道证实[24],T4K 矫治器有助于纠正替牙早期阶段Ⅱ类错合患者咬唇以及不良吞咽等习惯,其还可以缓解颊肌异常收缩造成的牙弓受损以及口呼吸和夜磨牙等症状起到缓解作用。同时,T4K 矫治器可借助 " 颊屏 " 来抑制颊肌对牙弓宽度造成不良影响。其次,T4K 矫治器借助 " 唇屏 " 将患者上唇和下唇牙槽弓相隔开,进而刺激其下颌生长发育[25,26]。本文还发现,本文随访 3 年显示,ANB 角和 L1-MP 角较治疗后明显降低（P＜0.05）。而 SNB 角和 U1-L1 角及下颌平面角和上面高以及下面高和下面高比例,覆盖均较治疗后明显增大(P＜0.05),这提示了患儿在治疗后 3 年内，其上下颌骨的矢状向关系得到了进一步的改善,但覆盖出现了增大现象。我们考虑原因主要是因为患儿因生长发育的影响,致使治疗后的下颌骨继续不断生长,下颌骨朝下方旋转的力度增大,因而下面高也持续增大,但因为治疗后并未佩戴其他的保持装置,使得其下前牙较治疗后出现复发直立,因此覆盖增加[27,28]。相关研究[29]报道证实,T4K 矫治器对于替牙早期Ⅱ类错合患者异常肌功能情况起到良好矫正作用,尤其是对于存在不良口腔习惯患者,其疗效更为显著,患者各种不良唇舌习惯以及夜磨牙和口呼吸等行为均得到有效纠正。并且 T4K 矫治器使得患者异常肌功能获得矫正，进而防止异常肌对其牙颌发育造成干扰,并且有助于下颌正常发育,避免错合情况更加严重[30]。

综上所述，应用 T4K 矫治器对替牙早期Ⅱ类错合患儿进行治疗的疗效较好,有利于其康复预后,值得在临床上给予相应的推广。

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