

# 成人骨性 Ⅱ类错骀治疗前后下切牙牙根吸收情况研究

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**摘要** 目的:利用 CBCT(Cone-Beam CT)三维重建技术评估成人骨性 Ⅱ类错骀患者在正颌手术前的正颌治疗中,下切牙唇向移动后的牙根吸收情况。方法:对 17 名需要进行正颌手术的成人骨性 Ⅱ类患者分别在矫治前及正颌手术前对下切牙区进行 CBCT 扫描,经软件处理进行三维重建,对每个牙根单独成像后分别测量其牙根体积。利用统计学方法比较治疗前后牙根体积量及吸收量百分比的变化。结果:①下切牙在唇向移动后牙根体积显著减小,具有统计学差异;②不同牙位间牙根吸收量百分比比较,无统计学差异。结论:成人骨性 Ⅱ类错骀在术前正颌治疗移动下切牙的过程中,下切牙牙根发生了较为明显的吸收。在临床治疗中需要引起足够重视。

**关键词** 牙根吸收;骨性 Ⅱ类;锥形束 CT

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## Comparative Evaluation of Root Resorption in Mandibular Incisors Following the Treatment of Adults with Skeletal Class

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**ABSTRACT Objective:** To evaluate the root resorption in mandibular incisors after orthodontics treatment of adults with skeletal class Ⅱ via CBCT (cone-beam computed tomography) reconstructed images. **Methods:** The study sample comprised 17 patients with skeletal Class Ⅱ malocclusion who need to undergo orthognathic surgery. CBCT images were taken before the treatment and before the surgery, then CBCT data were reconstructed with Mimics software. On these three-dimensional images, each mandibular incisor were segmented and volumes of each root were calculated. The difference between pre-treatment and post-treatment root volumes were statistically evaluated with a paired-samples t-test. Also, the percentage of root volume loss was compared with each other with one-way analysis. **Results:** ①The difference between the pre-treatment and post-treatment root volumes was statistically significant for all roots investigated. ②No statistically significant difference was found for the percentage of root volume loss. **Conclusion:** Following treatment before orthognathic surgery, significant root volume loss was observed for all investigated mandibular incisors. Grate attention should be paid and active treatment is necessary.

**Key words:** Root resorption; Skeletal class Ⅱ; Cone-beam computed tomography

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### 前言

骨性 Ⅱ类错骀是临床上常见的牙颌面畸形之一,影响患者的外貌、语音及咀嚼功能。生长发育已停止的严重 Ⅱ类错骀成年患者,目前临床常见治疗途径是正颌-正颌联合矫治<sup>[1]</sup>。Johnston 等多位学者认为,术前正颌下切牙唇向移动去代偿的程度直接决定正颌手术中骨块移动的质和量,从而为最大程度地建立术后颌系统的健康创造条件<sup>[2]</sup>。

然而,骨性 Ⅱ类错骀所特有的牙槽骨形态限制了下切牙的移动范围,使治疗中出现牙根吸收的可能性增加,直接影响术前正颌的质量<sup>[3-5]</sup>。

本研究以 CBCT 图像为基础,辅助重建软件对治疗前后的下切牙分别进行三维重建,量化评估其牙根吸收的情况。

### 1 材料与方法

#### 1.1 病例选择

选择 2010 年 11 月至 2011 年 5 月就诊于第四军医大学口腔医学院正畸科的成人骨性 Ⅱ类错骀患者 17 名,其中男 10 名,女 7 名,年龄 18~32.3 岁,平均年龄 23.7 岁。纳入标准为:①ANB<-4°,IMPA<83°;②面部侧貌为凹面型;③心理健康,接受正颌手术<sup>[6]</sup>。

#### 1.2 治疗过程

正颌-正颌联合治疗,术前正颌采用直丝弓矫治技术。托槽统一为 0.022 英寸槽沟 MBT 金属网底托槽(3M Gemini)。弓丝逐步换粗,采用镍钛摇椅弓法进行下切牙唇倾去代偿,平均去代偿时间为 7.6 个月。

#### 1.3 图像处理

所有患者分别在正颌前及正颌手术前 1 个月使用同一 CBCT 进行扫描(Galileo, sirona Dental Systems)扫描条件为电压 85kV,电流 21mA,层厚为 150μm。全部摄片均有同一放射

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科医师在相同的扫描参数下完成。



图 1 CBCT 显示下切牙图像

Figure 1 Image of mandibular incisor from CBCT

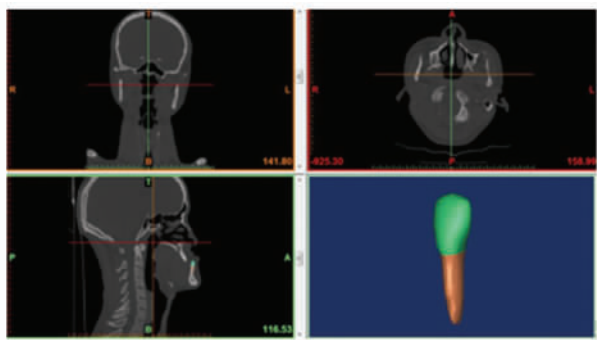


图 2 软件三维重建,分离左下中切牙(31)

Figure 2 3D reconstruct with Mimics and segment left mandibular central incisor(31)

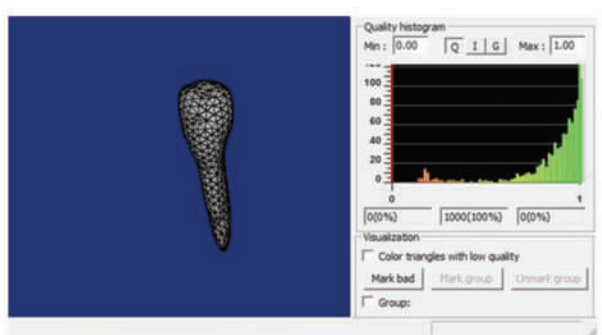


图 3 调整确定重建图像

Figure 3 Adjust the reconstructed image for orientation

图像储存为 DICOM 格式,输入电脑后使用 Mimics10.0 软件进行三维重建。以 CEJ 为界,分割牙冠和牙根部分(如图 2、3)。利用 3D Properties 选项计算每个牙根体积。(如图 4)对治疗前后的每个牙进行相同的操作,记录两组数据:每个牙根的

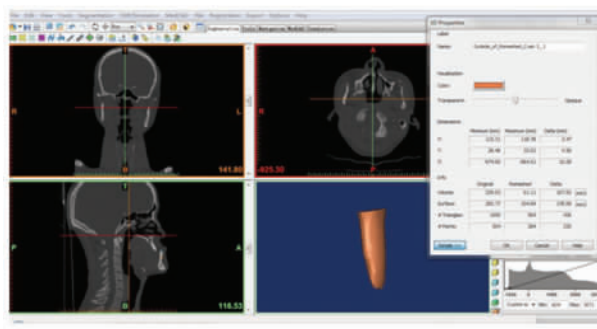


图 4 分离牙根,计算牙根体积

Figure 4 Isolate the root and automatic calculate root volume

体积变化量和变化量的百分比。

牙根体积变化量 = 治疗前牙根体积 - 治疗后牙根体积;

牙根体积变化量百分比 =  $\frac{\text{治疗前牙根体积} - \text{治疗后牙根体积}}{\text{治疗前牙根体积}} \times 100\%$

#### 1.4 统计学处理

全部数据输入 Excel 建立数据库。用 SPSS13.0 作统计处理,对治疗前后牙根体积变化值进行配对 t 检验。不同切牙之间牙根体积变化百分比进行单因素方差分析。

## 2 结果

统计结果见表 1 表 2。

#### 2.1 治疗前后牙根体积比较结果

左下中切牙(31)、左下侧切牙(32)、右下中切牙(41)、右下侧切牙(42)均显示有较为明显的吸收。配对 t 检验结果  $P < 0.01$ ,有统计学差异。

#### 2.2 不同牙位间进行单因素方差分析结果

$P > 0.05$ ,表明不同牙位之间的牙根体积减少量百分比无统计学差异。

## 3 讨论

#### 3.1 CBCT 在测量牙根吸收中的作用

正畸源性的牙根吸收(OIIRR)是造成错殆矫治失败的常见并发症<sup>[7]</sup>。目前,临床诊断牙根吸收方法多为根尖片、全景片、头颅定位侧位片等。这些传统影像学方法存在着放大率或影像重叠等缺点,并且在难以显示发生在近远中处的轻中度的牙根吸收<sup>[7-8]</sup>。近年来 Dудic 等学者,利用 CBCT 在三维方向上观察正畸过程中出现的牙根吸收情况,极大地提高了诊断准确性<sup>[9-10]</sup>。但其判别标准仍为传统二维指标,难以量化反映牙根吸收程度。本研究以 CBCT 图像为基础,引入第三方软件,三维重现下切牙(如图 2~4),首次量化测量骨性 Ⅲ 类这一特定错殆的下切牙牙根吸收情况。

#### 3.2 骨性 Ⅲ 类错殆与牙根吸收的联系

Beckmann、Chung 等研究认为骨性 Ⅲ 类错殆通常具有较高、窄形态特征的牙槽骨类型,其厚度限制弓丝作用下牙的移动<sup>[11-12]</sup>。通常认为,当正畸力唇向移动牙齿时,牙齿有移动出牙槽突的倾向,其程度与唇向移动量有关<sup>[13]</sup>。Handelman 进一步提出牙根部的骨皮质限制成为正畸牙移动的“解剖界限”(orthodontic wall),超过此界限的移动可导致骨皮质穿孔、牙根吸

收、牙龈退缩等严重后果<sup>[14]</sup>。因此,在骨性 Ⅲ类错殆的骨质条件下移动牙齿具有较大风险,尤其是在需要下切牙充分唇倾去代偿以获得最大手术量的病例中。

本研究选择病例均为需要正颌手术的骨性反殆患者,通过术前正畸,下切牙在手术前基本达到了正常的唇倾角度,但通过 CBCT 直接观察发现唇向移动后的下切牙均与舌侧骨皮质紧密接触(如图 1),其中 4 例甚至超出骨皮质范围。Kim 等学者的研究结果也显示类似情况<sup>[15]</sup>。

在本实验中,我们量化地测量牙根体积,发现在下颌四个切牙均发生较为明显的吸收,吸收量接近 10%。通过此结果,我们推断当下切牙在较窄的牙槽骨移动过程中,根尖点发生较

长的移动距离以恢复正常的牙齿角度,但其位移量相对于不良的牙槽骨形态是“过度的”<sup>[16]</sup>,牙根与坚硬的舌侧骨皮质发生接触,引起牙根显著的吸收。

### 3.3 正畸临床上的应用及展望

本研究提示正畸医师,在骨性 Ⅲ类错殆的矫治中应充分考虑牙齿与牙槽骨之间的位置关系,可通过拍摄 CBCT 明确诊断,结合患者具体情况选择合适的矫治计划。对于牙周支持条件较差,齿槽厚度较薄的病例,可以通过骨皮质切术<sup>[17]</sup>、根尖下截骨术等辅助手术,纠正前牙的轴倾度同时不改变牙根与牙槽骨的相对位置,降低牙根吸收等不良反应的发生率。

表 1 治疗前后牙根体积比较(mm<sup>3</sup>)

Table 1 Statistical comparison of pre-treatment and post-treatment root volumes(mm<sup>3</sup>)

Teeth	n	Pre-treatment	Post-treatment	P	Difference
		Mean± SD	Mean± SD		Mean± SD
Left mandibular central incisor(31)	17	229.03± 24.90	208.75± 30.51	0.001*	21.18± 25.73
Left mandibular lateral incisor(32)	15	207.70± 29.22	184.11± 22.72	0.001*	19.60± 23.11
Right mandibular central incisor(41)	17	215.14± 10.89	193.83± 19.48	0.000*	19.74± 12.01
Right mandibular lateral incisor(42)	15	197.69± 34.51	180.13± 20.55	0.000*	18.50± 17.12

※注 P<0.01 为有统计学意义

※Note:Statistically significant at P<0.01 level

表 2 不同切牙之间牙根吸收量比较(%)

Table 2 Statistical comparison of root volume loss in different incisors(%)

Teeth	n	Volume Loss(%)		
		Mean	SD	P
Left mandibular central incisor(31)	17	10.05	14.91	0.425
Left mandibular lateral incisor(32)	15	9.28	13.37	
Right mandibular central incisor(41)	17	9.14	11.20	
Right mandibular lateral incisor(42)	15	9.30	12.01	

### 参考文献(References)

- [1] Bousaba S, Dclatte M, Barbarin V, et al. Pre-and post-surgical orthodontic objectives and orthodontic preparation [J]. Rev Belge Med Den, 2002, 57(1): 37-48
- [2] Johnston C, Burden D, Kennedy D, et al. Class III surgical- orthodontic treatment: a cephalometric study[J]. Am J Orthod Dentofacial Orthop, 2006, 130 (3): 300-309
- [3] Handelman CS. The anterior alveolus: its importance in limiting orthodontic treatment and its influence on the occurrence of iatrogenic sequelae[J]. Angle Orthod, 1996,66(2):95-109, discussion: 109-110
- [4] Horiuchi A, Hotokezaka H, Kobayashi K. Correlation between cortical plate proximity and apical root resorption [J]. Am J Orthod Dentofacial Orthop, 1998, 114(3): 311-318
- [5] 周力, 孙伟, 白丁, 等. 不同垂直骨面型正常殆人切牙区颌骨形态结构的聚类分析[J]. 华西口腔医学杂志, 2005, 23(4): 299-302  
Zhou Li, Sun Wei, Bai Ding, et al. K-mean Cluster Analysis for Incisal Jaw Morphology of Normal Occlusion Subjects among Different Vertical Facial Skeletal Types[J]. West China Journal of Stomatology, 2005, 23(4): 299-302
- [6] Kerr WJS, Miller S, Dawber JS. Class malocclusion: surgery or orthodontics[J]. Br J Orthod, 1992, (19): 21-24
- [7] Maltha JC, van Leeuwen EJ, Dijkman GEHM, Kuijpers Jagtman AM. Incidence and severity of root resorption in orthodontically moved premolars in dogs[J]. Orthod Craniofac Res, 2004, 7: 115-121
- [8] Chan EKM, Darendeliler MA. Exploring the third dimension in root resorption[J]. Orthod Craniofac Res, 2004, 7: 64-70
- [9] Dudic A, Giannopoulou C, Leuzinger M. Detection of apical root resorption after orthodontic treatment by using panoramic radiography and cone-beam computed tomography of super-high resolution[J]. Am J Orthod Dentofacial Orthop, 2009, 135: 434-437
- [10] 李新桂, 董志强, 刘月华. 正畸牙移动早期牙根吸收的临床研究[J]. 中华口腔医学杂志, 2011, Jun: 1674-5760  
Li Xin-gui, Dong Zhi-qiang, Liu Yue-hua. A study of root resorption during the initial stages of orthodontic treatment [J]. Chin J Orthod, 2011 Jun: 1674-5760
- [11] Beckmann SH, Kuitert RB, Prah-Andersen B. Alveolar and skeletal dimensions associated with lower face height[J]. Am J Orthod Dentofacial Orthop, 1998, 113: 498-506

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- Med Assoc Thai, 2010,93 Suppl 1:S126-138
- [8] Athanassa Z, Siempos, II, Falagas ME. Impact of methicillin resistance on mortality in *Staphylococcus aureus* VAP: a systematic review[J]. Eur Respir J, 2008, 31(3):625-632
- [9] Reinhardt A, Kohler T, Wood P, et al. Development and persistence of antimicrobial resistance in *Pseudomonas aeruginosa*: a longitudinal observation in mechanically ventilated patients[J]. Antimicrob Agents Chemother, 2007, 51(4):1341-1350
- [10] 夏斌,周阿旺.呼吸机相关性肺炎病原菌的构成及耐药性分析[J].中国药业, 2011, 20(5):13-14  
Xia Bin, Zhou A-wang. Ventilator-associated pneumonia pathogens and antimicrobial resistance of the composition of [J]. Chinese Medicine, 2011, 20 (5):13-14
- [11] Burgess DS. Curbing resistance development: maximizing the utility of available agents[J]. J Manag Care Pharm, 2009, 15(5 Suppl):S5-9
- [12] 朱江,刘玉英.急诊监护病房呼吸机相关性肺炎病原菌及耐药性分析[J].现代预防医学, 2011, 38(10):1920-1921  
Zhu Jiang, Liu Yu-ying. Emergency care ward breathing machine correlation pneumonia pathogenic bacteria and resistance analysis[J]. Modern preventive medicine, 2011, 38(10):1920-1921
- [13] 马杏云,侯改英,张玉英.使用密闭式吸痰管发生呼吸机相关性肺炎病原菌及耐药现状的临床观察[J].中华医院感染学杂志, 2011, 21(7):1447-1448  
Ma Xing-yun, Hou Gai-ying, Zhang Yu-ying. Use the sputum suction pipe happen breathing equipped with machine correlation pathogenic bacteria and pneumonia resistance clinical observation of the current situation of the [J]. J infect res, 2011, 21 (7):1447-1448
- [14] Kuo LC, Yu CJ, Kuo ML, et al. Antimicrobial resistance of bacterial isolates from respiratory care wards in Taiwan: a horizontal surveillance study[J]. Int J Antimicrob Agents, 2008, 31(5):420-426
- [15] Gimenez MJ, Garcia-Rey C, Barberan J, et al. Clinical experience with tigecycline in the treatment of nosocomial infections caused by isolates exhibiting prevalent resistance mechanisms [J]. Rev Esp Quimioter, 2009, 22(1):48-56
- [16] Nachtigall I, Spies C. To count for--mortality on intensive care unit and the allocation of ventilator-associated pneumonia [J]. Crit Care Med, 2011, 39(12):2779-2780
- [17] Halpern NA, Hale KE, Sepkowitz KA, et al. A world without ventilator-associated pneumonia: Time to abandon surveillance and deconstruct the bundle[J]. Crit Care Med, 2012, 40(1):267-270
- [18] Contreras P, Milet B, Coria P. Evaluation of quantitative cultures of endotracheal aspirates for pediatric ventilator-associated pneumonia diagnosis: analytic, prospective study [J]. Rev Chilena Infectol, 2011, 28(4):349-356
- [19] Kalil AC, Wiener-Kronish JP. Is the evidence for benefits from ventilator-associated pneumonia bundles reliable enough for implementation in a general hospital[J]. Crit Care Med, 2012, 40(1):348-350
- [20] Dodek PM. Ventilator-associated pneumonia-in the eyes of the beholder[J]. Crit Care Med, 2012, 40(1):352-353
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- (上接第 1100 页)
- [12] Chung CJ, Jung S, Baik HS. Morphological characteristics of the symphyseal region in adult skeletal Class III crossbite and openbite malocclusions[J]. Angle Orthod, 2008, 78:38-43
- [13] 林久祥.口腔正畸学[M].人民卫生出版社, 2011, 第 1 版:415-416  
Lin jiu-xiang. Orthodontics [M]. People's Medical Publishing House, 2011, 1e, 415-416
- [14] Handelman CS. The anterior alveolus: its importance in limiting orthodontic treatment and its influence on the occurrence of iatrogenic sequelae[J]. Angle Orthod, 1996, 66:95-109. Discussion 109-110
- [15] Yoonji Kim, Je Uk Park, Yoon-Ah Kook. Alveolar Bone Loss around Incisors in Surgical Skeletal Class III Patients [J]. Angle Orthod, 2009, 79:676-682
- [16] Vardimon AD, Oren E, Ben-Bassat Y. Cortical bone remodeling tooth movement ratio during maxillary incisor retraction with tip versus torque movements [J]. Am J Orthod Dentofacial Orthop, 1998, 114:520-529
- [17] Wilcko WM, Wilcko T, Bouquet JE, et al. Rapid orthodontics with alveolar reshaping: two case reports of decrowding[J]. Int J Periodontics Restorative Dent, 2001, 21(1):9-19