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· 临床研究 ·

两种方法矫治骨性Ⅲ类错殆前、后上气道变化的临床研究

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【摘要】 目的 探讨微种植体支抗与颌间Ⅲ类牵引矫治成人骨性Ⅲ类错殆前后上气道矢状径的变化, 为临床治疗提供参考。方法 选取35例成人骨性Ⅲ类错殆患者, 利用直丝弓矫治技术矫治, 微种植体组15例(A组): 骨性Ⅲ类错殆重度病例(垂直高角)选择配合微种植体支抗; 颌间Ⅲ类牵引组20例(B组): 骨性Ⅲ类错殆轻、中度病例(垂直低角、均角)选择配合颌间Ⅲ类牵引, 测量分析矫治前后的头颅定位侧位片。结果 矫治后颅颌面测量指标的变化: A组蝶鞍中心-鼻根点-下牙槽座点构成的角(sella-nasion-supramental angle, SNB角)减小($P < 0.05$), 上牙槽座点-鼻根点-下牙槽座点构成的角(subspinale-nasion-supramental angle, ANB角)增大($P < 0.05$); B组SNB角减小($P < 0.05$), 蝶鞍中心-鼻根点-上牙槽座点构成的角(sella-nasion-subspinale angle, SNA角)、ANB角、下颌平面角(anterior skull base plane-mandibular plane angle, SN-MP角)增大($P < 0.05$)。矫治后上气道矢状径测量指标的变化: A组上气道矢状径舌咽段(TB-TPPW)减小($P < 0.05$); B组上气道矢状径鼻咽第一段(PNS-R)增大($P < 0.05$)。矫治后A组SNB减小、ANB增大的量大于B组, 差异有统计学意义($P < 0.05$); A组上气道TB-TPPW减小的量大于B组, 差异有统计学意义($P < 0.05$)。结论 利用微种植体支抗矫治成人骨性Ⅲ类错殆, 对上气道矢状径舌咽段产生消极影响。

【摘要】 上气道矢状径; 颌间Ⅲ类牵引; 微种植体; 骨性Ⅲ类错殆; 正畸矫治; 头颅定位侧位片; 阻塞性睡眠呼吸暂停低通气综合征; 下颌平面角

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Two methods of treatment for skeletal Class III malocclusion on airway changes before and after clinical research LIU Li¹, ZHOU Yan², ZHANG Daling², WANG Yuanyuan². 1. Department of Orthodontics, Affiliated Stomatological Hospital of Guilin Medical University, Guilin 541001, China; 2. Department of Orthodontics, The People's Hospital of Guangxi Zhuang Autonomous Region, Nanning 530021, China

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【Abstract】 Objective To investigate the changes in the sagittal diameter of the upper airway before and after the treatment of skeletal Class III malocclusion in adults with microimplant anchorage and class III intermaxillary elastics and to provide a reference for clinical treatment. **Methods** A total of 35 adult patients with skeletal Class III malocclusion were selected to be treated with the straight-wire technique. Microimplant group, 15 cases (group A): patients with severe skeletal Class III malocclusion (vertical high angle) were treated with the straight-wire technique combined with microimplant anchorage; class III intermaxillary elastics group, 20 cases (group B): Patients with mild or moderate skeletal Class III malocclusion (vertical low angle and average angle) were treated with the straight-wire technique combined with class III intermaxillary elastics, and cephalometric radiographs obtained before and after treatment in the upper airway in the two groups were measured and analyzed. **Results** Changes in cranial and maxillofacial measurements after

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correction: in group A, (sella-nasion-supramental angle) the SNB angle decreased significantly ($P < 0.05$), and (subspinale-nasion-supramental angle) the ANB angle increased significantly ($P < 0.05$). In group B, the SNB angle decreased significantly ($P < 0.05$), while (subspinale-nasion-subspinale angle) the SNA angle、ANB angle and anterior skull base plane-mandibular plane angle (Sn-MP) angle increased significantly ($P < 0.05$). Changes in sagittal diameter of the upper airway measurements after corrections: In group A, the width of the glossopharyngeal segment of the upper airway (TB-TP-PW) decreased significantly ($P < 0.05$). In group B, first segment width of the upper airway behind the hard palate (PNS-R) increased significantly ($P < 0.05$). After correction, the decreased SNB and increased ANB in group A was higher than that in group B, and the difference was statistically significant ($P < 0.05$). The decreased of TB-TPPW in upper airway of group A was greater than that of group B, and the difference was statistically significant ($P < 0.05$). **Conclusions** In the treatment of skeletal class III malocclusion with microimplant anchorage, the sagittal diameter of the glossopharyngeal segment of the upper airway has a negative impact.

【Key words】 sagittal diameter of the upper airway; Class III intermaxillary elastics; microimplant; skeletal Class III malocclusion; orthodontic treatment; cephalometric radiographs; obstructive sleep and hypopnea syndrome; mandibular plane angle

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成人骨性Ⅲ类错殆常伴有严重颌骨矢状向不调并(或)伴垂直向异常,是临床矫治的难点^[1]。目前颌间Ⅲ类牵引仍是Ⅲ类错殆最常用的辅助矫治方法,近年来下颌颊棚区微种植体支抗也逐渐应用于中、重度骨性Ⅲ类错殆的临床矫治^[2]。微种植体支抗作为一种强支抗,可大幅度内收下前牙,整体远移下牙弓,但与此同时是否会对上气道带来消极影响,值得进一步探讨。上气道解剖性狭窄是阻塞性睡眠呼吸暂停低通气综合征(obstructive sleep and hypopnea syndrome, OSAHS)的重要诱因之一^[3]。既往关于微种植体支抗与颌间Ⅲ类牵引两种方法矫治成人骨性Ⅲ类错殆前后上气道形态结构变化的研究较少,本研究对此进行探讨,以期临床工作提供参考。

1 对象和方法

1.1 研究对象

选取2015年1月至2019年12月在广西壮族自治区人民医院口腔正畸科完成正畸治疗的骨性Ⅲ类错殆患者35例,年龄18~38岁,利用直丝弓矫治技术矫治,根据颌间Ⅲ类牵引及微种植体支抗各自特点选择其相对适宜的矫治病例,即骨性Ⅲ类错殆轻、中度病例(垂直低角、均角)选择配合颌间Ⅲ类牵引,重度病例(垂直高角)选择配合微种植体支抗。微种植体组(A组)15例(ANB角平均 -4.2°),颌间Ⅲ类牵引组(B组)20例(ANB角平均 -2.6°),

疗程16~28个月。纳入标准:①骨性Ⅲ类,ANB角 $< 0.7^\circ$,下颌均能勉强后退至上下前牙切对切;②牙列完整(第三磨牙除外);③无明显牙周病、颞下颌关节疾病,无正畸治疗史;④BMI指数在正常范围,上气道无炎症表现;⑤矫治后错殆畸形解除,正侧貌得到改善,医患双方对矫治结果满意。排除标准:X线头颅定位侧位片图像不清晰者。本研究经广西壮族自治区人民医院伦理委员会审批,患者均签署知情同意书。

1.2 研究方法

1.2.1 矫治方法 固定矫治技术,均使用0.022英寸直丝弓托槽。A组:常规排齐牙列整平牙弓,待下颌换至0.018英寸 \times 0.025英寸不锈钢方丝时,于双侧下颌颊棚区植入微种植体,在侧切牙远中的下颌弓丝上放置牵引钩,牵引钩与微种植体之间加力,力值约250g/每侧,整体远移下牙列、内收下前牙,矫治前牙反殆,调整尖磨牙至I类关系。对部分伴前牙开殆或开殆趋势明显的高角病例,配合上颌颧牙槽嵴区微种植体,以压低上颌磨牙解除开殆。B组:常规排齐牙列整平牙弓,早期在非完成弓丝上选择短距离颌间Ⅲ类牵引,后期在稳定的不锈钢方丝上选择长距离颌间Ⅲ类牵引,矫治前牙反殆,调整尖磨牙至I类关系。

1.2.2 头颅定位侧位片拍摄设备与要求 均由本院同一名技师拍摄,使用设备为头颅定位曲面体层一体机(SOREDEX, CRANEX TOMECEPH, 芬

兰),放大率为1.128。拍摄时患者自然站立位,用头颅定位架使眼耳平面与地平面平行,双侧瞳孔连线与地平面平行,后牙轻轻接触到牙尖交错殆位,上下唇自然闭合,勿言语,勿吞咽,舌及口周肌肉放松,平静均匀呼吸,在患者呼气末拍摄。所有头颅定位侧位片软硬组织结构影像清晰,由笔者按统一标准严格定点描图测量,间隔2周后再次定点测量,结果取两次的平均值。

1.2.3 测量项目 ①SNA角:蝶鞍点S-鼻根点N-上齿槽座点A组成的角;②SNB角:蝶鞍点S-鼻根点N-下齿槽座点B组成的角;③ANB角:SNA与SNB角之差角;④前颅底平面(SN):经过N点与S点的直线;⑤下颌平面(MP):经过下颌角点Go与颏顶点Gn的直线;⑥SN-MP角:下颌平面角;⑦上气道矢状径鼻咽段(PNS-R距:后鼻棘点PNS与上咽壁最凹点R的距离;PNS-UPW距:后鼻棘点与颅底点Ba连线与咽后壁的交点为上咽壁点UPW,PNS与UPM的距离);⑧上气道矢状径腭咽段(SPP-SPPW距:从软腭中点后缘SPP向咽后壁做TB-TPPW的平行线,与咽后壁的交点为SPPW,SPP与SPPW的距离;U-MPW距:悬雍垂尖U向咽后壁做垂线,与咽后壁的交点为中咽壁点MPW,U与MPW的距离);⑨上气道矢状径舌咽段(TB-TPPW距,下齿槽座点与下颌角点的连线与舌根的交点为TB、与咽后壁的交点为TPPW,TB与TPPW的距离);⑩上气道矢状径喉咽段(V-LPW距:会厌谷底点V向咽后壁做垂线,与咽喉壁的交点为下咽壁点LPW,V与LPW的距离)。见图1、图2。

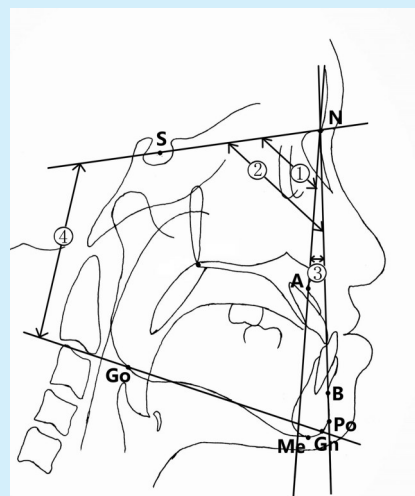
1.3 统计学方法

应用统计软件SPSS 20.0 进行统计分析。数据符合正态分布且方差齐,以均数±标准差($\bar{x} \pm s$)表示,组内矫治前后比较采用配对t检验,两组间比较采用独立样本t检验。 $P < 0.05$ 为差异有统计学意义。

2 结果

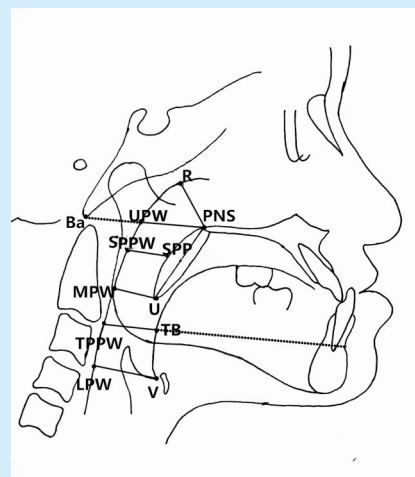
2.1 矫治后颅颌面测量指标的变化

A组矫治后ANB增大,SNB减小,差异有统计学意义($P < 0.05$,表1);B组矫治后SNA、ANB、SN-MP增大,SNB减小,差异有统计学意义($P < 0.05$);其余颅颌面指标差异无统计学意义($P > 0.05$)。两组SNB均减小,提示在内收下前牙时,下颌牙槽基骨都发生改建。A组SN-MP无明显变化,B组SN-MP增大,说明微种植体支抗组的下颌平面控制良好,而颌间Ⅲ类牵引组下颌平面发生



S: sella; N: nasion; A: subspinale; B: supramental; Go: gonion; Po: pogonion; Me: menton; Gn: gnathion; SN: SN plane; MP: mandibular plane; SNA: sella-nasion-subspinale angle; SNB: sella-nasion-supramental angle; ANB: difference between SNA and SNB; SN-MP: SN plane-mandibular plane angle; ①: SNA angle; ②: SNB angle; ③: ANB angle; ④: SN-MP angle

Figure 1 Cranial-maxillofacial measurement items
图1 颅颌面测量项目



PNS: posterior nasal spine; Ba: basion; R: pits of upper pharyngeal cavity; SPP: middle of soft palate; U: tip of uvula; V: bottom of valleculae linguae; PNS-R: first segment width of the upper airway behind the hard palate; PNS-UPW: second segment width of the airway behind the hard palate; SPP-SPPW: width of the airway behind the soft palate; U-MPW: width of the airway at the uvula; TB-TPPW: width of the glossopharyngeal segment of the upper airway; V-LPW: width of laryngopharyngeal segment of upper airway

Figure 2 Upper-airway measurement items
图2 上气道测量项目

顺时针旋转。

2.2 矫治后上气道矢状径测量指标的变化

A组矫治后TB-TPPW减小,差异有统计学意义($P < 0.05$,表1);B组矫治后PNS-R增大,差异有统计学意义($P < 0.05$);其余上气道指标差异无统计学意义($P > 0.05$)。A组TB-TPPW减小,提示利用微种植支抗,会使上气道舌咽段矢状径缩窄;B组PNS-R增大,提示利用颌间Ⅲ类牵引可使上气

道鼻咽段矢状径增宽。

2.3 矫治前后各指标变化量的比较

矫治后A组SNB减小、ANB增大的量大于B组,差异有统计学意义($P < 0.05$,表1);A组上气道TB-TPPW减小的量大于B组,差异有统计学意义($P < 0.05$),提示利用微种植体支抗对颌骨矢状向不调改善较颌间Ⅲ类牵引明显,但可引起上气道矢状径舌咽段变窄。

表1 矫治前后各项测量项目的变化

Table 1 Changes in each measurement item before and after treatment

Measurement items	Group A					Group B					Comparing these two groups' changes	
	Before-treatment	After-treatment	Average change	<i>t</i>	<i>P</i>	Before-treatment	After-treatment	Average change	<i>t</i>	<i>P</i>	<i>t</i>	<i>P</i>
Cranial-maxillofacial measurements(°)												
SNA	78.4 ± 2.6	78.6 ± 2.6	-0.2 ± 0.5	-1.338	0.214	78.7 ± 2.8	79.1 ± 2.8	-0.4 ± 0.7	-2.663	0.015	-0.758	0.455
SNB	82.5 ± 2.5	80.8 ± 2.6	1.8 ± 1.0	5.653	<0.001	81.4 ± 2.6	81.0 ± 2.7	0.3 ± 0.6	2.617	0.017	-4.248	0.001
ANB	-4.2 ± 2.2	-2.2 ± 2.1	-2.0 ± 0.6	-9.989	<0.001	-2.6 ± 1.3	-1.9 ± 1.1	-0.7 ± 0.5	-5.813	<0.001	5.767	<0.001
SN-MP	34.8 ± 5.4	35.1 ± 5.6	-0.3 ± 1.1	-0.836	0.425	28.5 ± 5.6	29.1 ± 5.7	-0.6 ± 1.2	-1.927	0.047	-0.303	0.764
Upper-airway measurements(mm)												
PNS-R	21.7 ± 3.8	21.7 ± 3.4	-0.1 ± 1.1	-0.143	0.889	21.5 ± 2.9	22.5 ± 2.7	-1.0 ± 1.7	-2.760	0.012	-1.680	0.104
PNS-UPW	23.8 ± 2.1	24.1 ± 2.6	-0.4 ± 1.0	-1.137	0.285	24.5 ± 2.9	25.0 ± 2.0	-0.5 ± 1.8	-2.860	0.214	-0.270	0.789
SPP-SPPW	13.0 ± 2.5	12.7 ± 3.3	0.2 ± 2.0	0.343	0.739	11.7 ± 2.5	12.0 ± 2.9	-0.3 ± 2.0	-0.679	0.506	-0.672	0.507
U-MPW	11.9 ± 3.2	11.3 ± 4.1	0.6 ± 1.9	1.075	0.310	11.3 ± 2.7	11.2 ± 3.3	0.1 ± 2.5	0.224	0.825	-0.574	0.571
TB-TPPW	13.9 ± 3.6	11.1 ± 4.0	2.8 ± 2.2	3.039	0.042	13.2 ± 3.2	12.3 ± 3.8	0.9 ± 3.1	1.222	0.237	-2.378	0.012
V-LPW	16.3 ± 2.5	15.7 ± 3.7	0.6 ± 2.7	0.709	0.496	17.7 ± 3.3	17.5 ± 2.6	0.2 ± 2.9	0.272	0.789	-0.390	0.700

SNA: sella-nasion-subspinale angle; SNB: sella-nasion-supramental angle; ANB: difference value between SNA and SNB; SN-MP: SN plane-mandibular plane angle; PNS-R: first segment width of the upper airway behind the hard palate; PNS-UPW: second segment width of the airway behind the hard palate; SPP-SPPW: width of the airway behind the soft palate; U-MPW: width of the airway at the uvula; TB-TPPW: width of the glossopharyngeal segment of the upper airway; V-LPW: width of laryngopharyngeal

2.4 典型病例1

患者女,19岁,主诉地包天,要求矫治。全身状况良好,否认正畸治疗史,否认不良习惯。父亲有类似错殆表现。临床检查:正面观左右面部基本对称,颞居中,长面型;侧面观凹面型,下颌前突,下颌体过长,鼻唇角尚可,颞唇沟浅;12、11、21、22对刃,开殆趋势明显,中线齐,尖、磨牙完全近中关系;18、28、38、48完全萌出。下颌无功能性后退,开口度、开口型正常,颞下颌关节无压痛、无弹响。诊断:安氏Ⅲ类前牙对刃,Ⅲ类高角骨面型。矫治方案:直丝弓技术,拔除18、28、37、47。排齐牙列,整平牙弓,配合上颌双侧颧牙槽嵴植入微种植体以压低上颌磨牙,下颌双侧颊棚区植入微种植体以整体远移下牙列,利用38、48代替37、47,矫治全程配合“舌肌上抬”肌功能训练,疗程19个月。矫治后前牙覆殆覆盖正常,双侧尖、磨牙Ⅰ类关系,上下颌矢状不调有所改善,上气道舌咽段

变窄。见图3、表2。

2.5 典型病例2

患者男,26岁,主诉地包天,要求矫治。否认正畸治疗史,否认不良习惯,否认家族史。临床检查:正面观左右面部基本对称,颞居中,短面型;侧面观凹面型,鼻唇角基本正常,颞唇沟浅,下颌前突;12、11、21、22反殆,反覆殆反覆盖浅,下颌中线左偏约0.6 mm,右侧尖、磨牙近中关系,左侧尖、磨牙基本中性。下颌可勉强后退至切对切,开口度、开口型正常,颞下颌关节无压痛、无弹响。诊断:安氏Ⅲ类亚类前牙反殆,Ⅲ类低角骨面型,上颌后缩,下颌前突。矫治方案:非拔牙矫治,直丝弓技术,排齐牙列,整平牙弓,配合颌间Ⅲ类牵引,疗程16个月。矫治后前牙覆殆覆盖正常,双侧尖、磨牙Ⅰ类关系,上下颌骨矢状不调有所改善,上气道鼻咽段少量增宽。见图4、表3。



表2 应用微种植体支抗矫治成人骨性Ⅲ类错殆病例矫治前、后X线头影测量值

Table 2 X-ray cephalometric values measured before and after the treatment of adult skeletal Class III malocclusion correction using microimplant anchorage

Measurement items	Before-treatment	After-treatment
Cranial-maxillofacial measurements(°)		
SNA	76.5	76.5
SNB	80.5	79.5
ANB	-4.0	-3.0
SN-MP	41.5	42.0
Upper-airway measurements(mm)		
PNS-R	28.3	27.0
PNS-UPW	25.0	24.5
SPP-SPPW	14.7	15.7
U-MPW	12.5	13.0
TB-TPPW	16.0	14.0
V-LPW	15.0	14.5

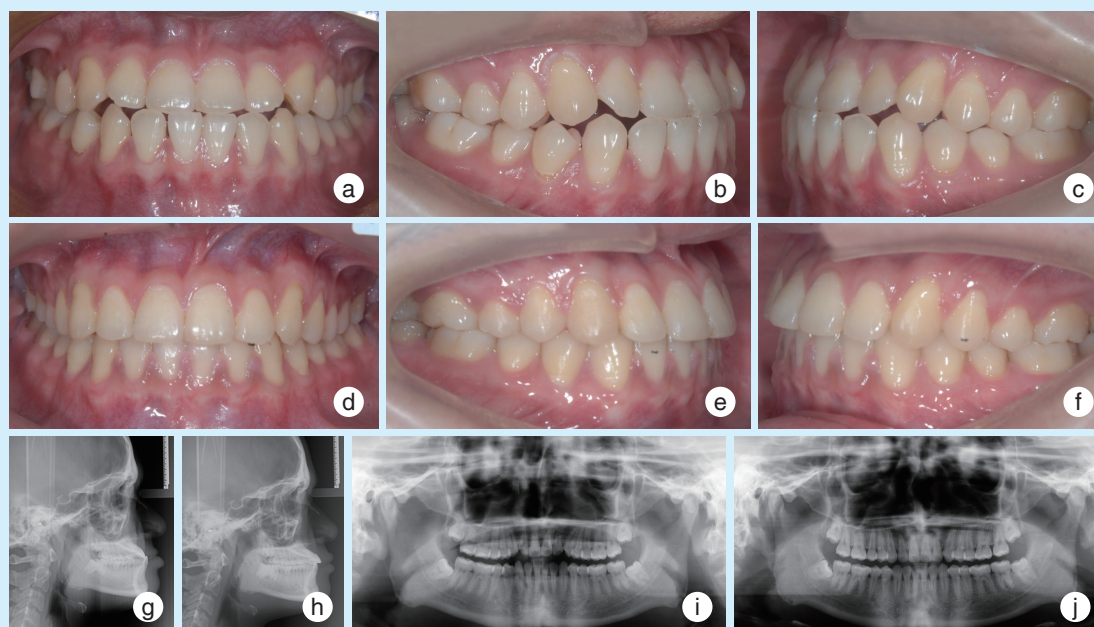
SNA: sella-nasion-subspinale angle; SNB: sella-nasion-supramental angle; ANB: difference value between SNA and SNB; SN-MP: SN plane-mandibular plane angle; PNS-R: first segment width of the upper airway behind the hard palate; PNS-UPW: second segment width of the airway behind the hard palate; SPP-SPPW: width of the airway behind the soft palate; U-MPW: width of the airway at the uvula; TB-TPPW: width of the glossopharyngeal segment of the upper airway; V-LPW: width of laryngopharyngeal

3 讨论

3.1 两种方法对颅颌牙面形态的影响比较

骨性Ⅲ类错殆的发病机制有三种:单纯上颌发育不足;单纯下颌发育过度;上颌发育不足伴下颌发育过度。本研究骨性Ⅲ类错殆病例矫治后,不仅牙殆畸形得到明显改善,上下颌骨矢状向不调也得到了改善。但微种植体支抗组矫治后SNB角减小量和ANB角增大量明显大于颌间Ⅲ类牵引组,提示微种植体支抗更适用用下颌发育过度者,同时进一步证实微种植体支抗对于改善颌骨间矢状向不调较颌间Ⅲ类牵引具明显优势。矫治后颌间Ⅲ类牵引组下颌平面角增大,一方面颌间牵引可使上颌磨牙伸长^[4],另一方面应该与“楔形效应”有关,即颌间牵引使下磨牙牙轴远中倾斜或磨牙远中移动时,上下颌间距增大,下颌发生顺时针旋转,所以颌间Ⅲ类牵引在高角病例中应慎用^[5]。微种植体支抗组,矫治中并未在下磨牙与微种植体间主动加力,在整体远移下牙列的同时,亦有“楔形效应”,但下颌平面角却无明显变化,应该是微种植体支抗在远移下牙列的同时其垂直向的分力有压低磨牙的作用。

本研究虽然根据颌间Ⅲ类牵引及微种植体支



a-c: intraoral photos before treatment; d-f: intraoral photos 16 months after treatment; g: lateral cephalometric radiograph before treatment; h: lateral cephalometric radiograph 16 months after treatment, the sagittal diameter of the upper airway is increased at nasopharynx; i: panoramic radiograph before treatment; j: panoramic radiograph 16 months after treatment

Figure 4 Adult skeletal Class III malocclusion correction using Class III intermaxillary elastics

图4 应用颌间Ⅲ类牵引矫治成人骨性Ⅲ类错殆

表3 应用颌间Ⅲ类牵引矫治成人骨性Ⅲ类错殆病例矫治前、后X线头影测量值

Table 3 X-ray cephalometric values measured before and after the treatment of adult skeletal Class III malocclusion correction using Class III intermaxillary elastics

Measurement items	Before-treatment	After-treatment
Cranial-maxillofacial measurements(°)		
SNA	80.5	82.0
SNB	84.5	84.0
ANB	-4.5	-3.5
SN-MP	17.0	17.5
Upper-airway measurements(mm)		
PNS-R	22.0	24.0
PNS-UPW	22.0	24.0
SPP-SPPW	7.5	9.0
U-MPW	11.5	10.5
TB-TPPW	11.0	12.0
V-LPW	18.0	18.0

SNA: sella-nasion-subspinale angle; SNB: sella-nasion-supramental angle; ANB: difference value between SNA and SNB; SN-MP: SN plane-mandibular plane angle; PNS-R: first segment width of the upper airway behind the hard palate; PNS-UPW: second segment width of the airway behind the hard palate; SPP-SPPW: width of the airway behind the soft palate; U-MPW: width of the airway at the uvula; TB-TPPW: width of the glossopharyngeal segment of the upper airway; V-LPW: width of laryngopharyngeal segment of upper airway

抗各自特点选择相对适宜的病例,且早期在非完成弓丝上多选择短距离颌间Ⅲ类牵引,后期在稳定不锈钢方丝上才选择长距离颌间Ⅲ类牵引,但仍不可避免发生矫治后的下颌平面角增大。另外,颌间Ⅲ类牵引对患者依从性要求较高,尤其对配合下颌多曲方丝弓矫治的骨性Ⅲ类错殆病例。而微种植体支抗对骨性Ⅲ类矢状、垂直向畸形矫治效果确切,且对患者依从性要求低,但其为侵入性治疗,且有不稳定性和对周围软组织有刺激性等缺点^[6],临床上应根据骨性Ⅲ类错殆的严重程度、垂直骨面型及患者依从性等特点合理选择。

3.2 两种方法对上气道形态的影响比较

上气道包括鼻咽、口咽和喉咽段,其中口咽(腭咽和舌咽)是整个上气道最狭窄区域,也是OSAHS患者上气道狭窄的主要集中部位。既往研究显示,错殆畸形伴发的上气道狭窄多见于骨性Ⅱ类错殆,且狭窄多位于舌咽段^[7]。大部分研究认为骨性Ⅲ类错殆上气道口咽段较Ⅰ类、Ⅱ类骨面型宽大^[8]。陈巧云等^[9]研究显示,受上颌骨位置的影响,13~18岁上颌发育不足的青少年鼻咽段矢状径较Ⅰ类骨面型狭窄,口咽、喉咽段间隙基本正常。Memon等^[10]也认为上、下颌骨的矢状向位

置影响上气道的尺寸。本研究颌间Ⅲ类牵引组矫治后上气道鼻咽段PNS-R增大,可能是因为颌间牵引使上颌骨顺时针旋转^[11],PNS点转动后使得上气道鼻咽段增宽。提示对于上颌发育不足者,矫治前牙反骀对鼻咽段矢状径有积极作用。舌咽、咽喉属于上气道下间隙,其间隙大小受下颌骨位置、长度影响^[12];下颌发育过度者,舌、舌骨、颏舌肌等舌骨下肌群随之前移,使气道下间隙增大,因此骨性Ⅲ类下颌发育过度者的舌咽、咽喉段气道较Ⅰ类骨面型宽大^[13]。

目前,随着微种植钉支抗在正畸临床中的广泛应用,骨性Ⅲ类正畸掩饰性矫治的范围也得以扩大。本研究微种植体支抗组的ANB角平均为-4.2°,在种植钉支抗支持下,下前牙、下牙弓的回收能力逐渐提高,舌、舌根大幅后退。本研究微种植体组矫治后SNB角显著减小,矫治前后变化量大于颌间Ⅲ类牵引组,与此同时,上气道舌咽段TB-TPPW减小,可能与微种植体支持下整体远中移动下牙列、大幅度内收下前牙有关,导致固有口腔容积减小,舌、舌骨被迫后退,也进一步证实了下颌骨的矢状位置与口咽气道大小呈正相关^[14]。因此,对于Ⅲ类骨面型的病例,矫治前亦不可忽视上气道间隙的评估,特别是设计配合下颌颊棚区微种植体支抗的病例,需评估其上气道下间隙能否承受下牙列大幅度后退带来的消极作用;对于矫治前上气道已明显狭窄的病例,应慎用该矫治方法,谨防医源性OSAHS的发生。本研究中虽然微种植体支抗组矫治后舌咽段矢状径变小,但其平均值仍在正常值范围内。

本研究使用的是头颅侧位片,其与CBCT矢状向分析高度一致,是一种分析上气道结构变化的可靠手段。但上气道是三维立体结构,随着CBCT在口腔临床的普遍应用,拟进一步开展从横截面及容积方向评价骨性Ⅲ类错骀矫治前后上气道立体结构变化的研究。

【Author contributions】 Liu L analyzed the data and wrote the article. Zhou Y designed the study and revised the article. Zhang DL and Wang YY processed the research and collected the data. All authors read and approved the final manuscript as submitted.

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