

· 临床研究 ·

骨膜压揉加抗阻力运动对阻塞性睡眠呼吸暂停低通气综合症的疗效观察

陈香仙 朱国萍

【摘要】目的 观察骨膜压揉加抗阻力运动对阻塞性睡眠呼吸暂停低通气综合征(OSAHS)的影响及作用机制。**方法** 选取 OSAHS 中度患者 32 例,按随机数字表法分为训练组和药物组,每组 16 例。训练组采用骨膜压揉加抗阻力运动处方训练,药物组采用常规药物口服治疗,治疗前、后分别采用睡眠呼吸监测系统(PSG)、Thera-Band 弹力带及 PWS 型角度测量仪对 2 组患者的 PSG 参数、颈部周围肌肉力量及颈椎活动度进行评估。**结果** 治疗后,训练组与治疗前比较,PSG 指标[包括呼吸事件(AHI)、睡眠结构(SS)、觉醒次数(AN)、非快速动眼期(NREM)、快速动眼期(REM)、平均血氧饱和度($MSaO_2$)、最低血氧饱和度($LSaO_2$)、氧减饱和度指数(ODI)]均较前改善,差异有统计学意义($P < 0.05$);药物组最低血氧饱和度($LSaO_2$)及氧减饱和度指数(ODI)与治疗前相比有所改善,差异有统计学意义($P < 0.05$),剩余 PSG 指标与治疗前比较,差异无统计学意义($P > 0.05$);训练组 PSG 指标改善程度优于药物组,差异有统计学意义($P < 0.05$)。治疗后,训练组在颈部负荷下牵拉平均停留时间较前延长,差异有统计学意义($P < 0.05$);药物组平均停留时间较前无明显变化,差异无统计学意义($P > 0.05$);训练组较药物组平均停留时间长,组间差异有统计学意义($P < 0.05$)。治疗后训练组颈椎平均活动度较前增加,差异有统计学意义($P < 0.05$);药物组颈椎平均活动度与治疗前比较,差异无统计学意义($P > 0.05$);训练组颈椎平均活动度与药物组相比明显改善,差异有统计学意义($P < 0.05$)。**结论** 气道周围骨骼肌病变可能是导致 OSAHS 形成的重要原因,骨膜压揉加抗阻力运动对 OSAHS 患者具有显著疗效。

【关键词】 阻塞性睡眠呼吸暂停低通气综合征; 骨膜压揉; 抗阻力运动

Periosteal kneading plus resistance exercise for obstructive sleep apnea syndrome CHEN Xiang-xian*, ZHU Guo-ping. * College of Physical Education, Anhui Normal University, Wuhu 241000, China

Corresponding author: ZHU Guo-ping, Email: gpz1996@yahoo.com

【Abstract】Objective To observe the effect and mechanism of periosteal pressure kneading plus resistance exercise in improving obstructive sleep apnea/hypopnea syndrome (OSAHS). **Methods** Thirty-two patients with moderate OSAHS were divided randomly into a kneading plus resistance training group and a conventional drug group, each group with 16 patients. The training group was given periosteal pressure kneading plus resistance exercise while the drug group received only conventional oral treatment with drugs. Before and after treatment, polysomnography (PSG), Thera-Band elastic bands and a PWS angle measuring instrument were used to observe PSG parameters around the neck plus the muscle strength and cervical activity of both groups. **Results** In the training group the following components of the PSG index had improved significantly compared with before treatment: respiratory events (AHI), sleep structure (SS), awakening number (AN), non-rapid eye movement (NREM), rapid eye movement (REM), mean oxyhemoglobin saturation ($MSaO_2$) events, lowest oxyhemoglobin saturation ($LSaO_2$), and the index of oxyhemoglobin saturation decrease (ODI). In the drug group only the $LSaO_2$ and ODI had improved significantly compared with before treatment. In terms of the PSG parameters, the training group demonstrated significantly greater improvement than the drug group. After treatment, the training group's average residence time in neck load pulling was extended significantly while that of the drug group showed no significant change. The difference between the groups was statistically significant. After the treatment the training group's average activity of the cervical spine was also significantly increased, and again the drug group showed no significant improvement. **Conclusion** Skeletal lesions in peripheral airways may be an important factor in the formation of OSAHS. Periosteum kneading with resistance exercise has an obvious curative effect on OSAHS.

DOI:10.3760/cma.j.issn.0254-1424.2012.011.008

基金项目:国家自然科学基金专项(31040003);安徽师范大学学术著作培育基金资助(2010xszz014)

作者单位:241000 芜湖,安徽师范大学体育学院(陈香仙);安徽师范大学生命科学学院(朱国萍)

通信作者:朱国萍,Email:gpz1996@yahoo.com

【Key words】 Obstructive sleep apnea/hypopnea syndrome; Periosteal pressure; Resistance exercise; Massage

阻塞性睡眠呼吸暂停低通气综合征 (Obstructive Sleep Apnea-Hypopnea Syndrome, OSAHS), 是指在睡眠期间反复发生上气道阻塞并引起间歇性呼吸暂停的疾病^[1]。流行病学资料显示, 欧洲国家 OSAHS 的患病率为 3.0% ~ 4.7%, 日本为 2.3% ~ 4.2%, 中国 30 岁以上的人群患病率为 4.0% ~ 7.0%, 65 岁以上的人群患病率高达 20.0%, 男女发病比例为 5:1 左右^[2-3]。有研究表明, OSAHS 的发生与肥胖、年龄、性别、家族遗传、吸烟、饮酒、颅面畸形及心血管疾病等因素相关^[4]。也有研究认为上气道机械性阻塞 (解剖因素)、气道外组织压迫引起气道塌陷是导致 OSAHS 发生的主要原因, 治疗的关键在于解除上气道狭窄与阻塞, 故外科手术是其首选治疗手段^[5-6]。本研究采用骨膜压揉加抗阻力运动进行治疗, 旨在探讨气道周围骨骼肌病变是否与 OSAHS 发病相关, 观察骨膜压揉加抗阻力运动对 OSAHS 的治疗效果。报道如下。

对象和方法

一、研究对象

入选标准: ①符合国际惯用的 OSAHS 诊断标准^[7], 睡眠期呼吸暂停低通气指数 (apneahypopnea index, AHI) ≥ 5 ; ②AHI 指数在 21 ~ 40 间的中度患者; ③睡眠呼吸暂停过程中, 口和鼻无气流, 但胸腹式呼吸仍存在; ④获本校伦理委员会批准, 患者均签署知情同意书。排除标准^[7]: ①患有中枢性睡眠呼吸暂停综合征、甲状腺功能低下、肢端肥大症、喉痉挛、声带麻痹、癫痫及颈椎肿瘤等疾病; ②有颈椎结核病史及外伤手术史; ③极度体虚、不能耐受训练的患者。

选取 2010 年 9 月至 2011 年 10 月在我校生理生化检测与运动康复实验室进行物理康复的 OSAHS 中度患者 32 例。按随机数字表法分为训练组和药物组, 每组 16 例。2 组患者一般资料比较, 差异无统计学意义 ($P > 0.05$), 详见表 1。

表 1 2 组患者一般资料比较

组别	例数	性别 (例)		年龄 (岁, $\bar{x} \pm s$)	病程 (年, $\bar{x} \pm s$)
		男	女		
训练组	16	13	3	39.7 $\pm$ 2.5	10.2 $\pm$ 7.3
药物组	16	11	5	39.6 $\pm$ 3.1	10.6 $\pm$ 7.1

二、治疗方法

训练组采用骨膜压揉加抗阻力运动处方训练, 3 d 为 1 疗程, 第 1 天进行骨膜压揉, 第 2 天进行抗阻力运动, 第 3 天休息, 持续 15 疗程, 共 45 d; 药物组采用常规药物口服治疗, 共 45 d。

(一) 骨膜压揉加抗阻力运动处方

1. 骨膜压揉处方: 以中等力量压揉颈前上颌舌骨肌、下颌舌骨肌、二腹肌、胸锁乳突肌、斜角肌、颈夹肌、多裂肌、回旋肌、斜方肌、肩胛提肌及菱形肌等, 压揉频率为 70 次/min, 每次 60 min。

2. 抗阻力运动处方: 采用 Thera-Band^[8] 弹力带进行训练, 将其一端固定于患者头部, 另一端固定于把杆上, 分别以前屈、后伸、左侧屈、右侧屈、左旋转及右旋转 6 个方向拉伸弹力带, 每次 60 min。(1) 采用坐位静力牵引颈椎, 头部拉伸弹力带至 2.25 m 处 (原长度的 150%), 保持 1 min, 每个方向训练 3 组; (2) 患者取站立位, 头部拉伸弹力带至 2.25 m 处并同时摆动头部, 每个方向摆动 15 次, 共训练 3 组。

(二) 药物治疗

依照运动功能评定^[9]中的相关标准, 由呼吸专科医生开具口服药物处方, 具体如下: 阿米三嗪 60 mg, 2 次/日; 乙酰唑胺 200 mg, 2 次/日; 茶碱 150 mg, 2 次/日。连续服用 45 d。

三、临床疗效评定

1. 睡眠呼吸监测指标评定: 采用澳大利亚 Compu-medics 公司生产的睡眠呼吸监测系统 (polysomnography, PSG), 全夜 7 h 连续监测患者的各项指标变化, 监测前 24 h 禁止患者服用安眠药、酒、浓茶及咖啡等, 监测指标包括: AHI、睡眠结构 (sleep structure, SS)、觉醒指数 (arousal index, AI)、觉醒次数 (awakening number, AN)、非快速动眼期 (non-rapid eye movement, NREM)、快速动眼期 (rapid eye movement, REM)、平均血氧饱和度 (mean oxyhemoglobin saturation, MSaO₂)、最低血氧饱和度 (lowest of oxyhemoglobin saturation, LSaO₂)、氧减饱和度指数 (oxyhemoglobin saturation decreased index, ODI)。

2. 颈部周围肌肉力量评定: 嘱患者取站立位, 采用长 1.5 m、宽 0.15 m、厚 0.002 m 的弹性塑胶带进行颈部周围力量评定, 将弹性带一端系于患者头部, 另一端固定于把杆上, 测定患者在拉伸弹力带至 2.25 m 时所停留的时间。

3. 颈椎活动度评定: 指导患者坐在靠背椅上, 双肩紧贴椅背完成转动头部的动作, 采用江苏常州钱璟医疗器械厂生产的 PWS 型颈椎活动度测量仪对患者进行前屈、后伸、左侧屈、右侧屈、左旋转及右旋转六个方向上的活动幅度测量。

四、统计学处理

本研究采用 SPSS 16.0 版统计学软件包进行数据

分析,计量资料采用($\bar{x} \pm s$)表示, $P < 0.05$ 认为差异有统计学意义。

结 果

一、2 组患者 PSG 参数比较

治疗后,训练组与治疗前比较,包括 AHI、SS、AN、NREM、REM、MSaO₂、LSaO₂ 及 ODI 均较前改善,REM 时间减少、NREM 时间增加,浅睡眠持续时间(Ⅰ期+Ⅱ期)相对缩短,深睡眠持续时间(Ⅲ期+Ⅳ期)延长,REM 睡眠占总睡眠时间的比例增加,AN 减少,差异有统计学意义($P < 0.05$);药物组治疗后仍存在睡眠结构紊乱等情况,各期睡眠所占比例失调,睡眠周期不全,浅睡眠持续时间延长,深睡眠持续时间缩短,NREM 睡眠被频繁中断,除 LSaO₂ 及 ODI 外,药物组剩余 PSG 指标与治疗前比较,差异均无统计学意义($P > 0.05$);训练组 PSG 指标改善程度优于药物组,差异有统计学意义($P < 0.05$)。详见表 2。

二、2 组患者颈椎周围肌肉力量比较

治疗后,训练组在颈部负荷下牵拉平均停留时间

较前延长,六个方向的肌肉力量均显著增加,差异有统计学意义($P < 0.05$);药物组平均停留时间较前无明显变化,差异无统计学意义($P > 0.05$);训练组较药物组平均停留时间长,组间差异有统计学意义($P < 0.05$)。详见表 3。

三、2 组患者颈椎活动度比较

治疗后训练组颈椎平均活动度较前增加,差异有统计学意义($P < 0.05$);药物组颈椎平均活动度与治疗前比较,差异无统计学意义($P > 0.05$);训练组颈椎平均活动度与药物组相比明显改善,差异有统计学意义($P < 0.05$)。

讨 论

呼吸道周围肌肉如膈肌等在吸气时因收缩而产生力量,促使咽气道关闭形成负压,同时,以颊舌肌为主的咽扩张肌与咽腔内负压形成对抗,从而维持上气道的开放状态^[10]。通过对本研究入选患者进行观察后发现,呼吸道周围的骨骼肌存在不同程度的痉挛,其附着处骨膜出现水肿,较为明显的肌肉有上颌舌骨肌、下

表 2 2 组患者治疗前、后 PSG 参数指标比较($\bar{x} \pm s$)

组别	例数	AI(次/h)	SS(%)	AN(次/h)	NREM(%)		REM(%)	AHI(次/h)	MSaO ₂ (%)	LSaO ₂ (%)	ODI(次/h)	
					I + II	III + IV						
训练组												
治疗前	16	28.8 ± 4.6	73.9 ± 5.2	19.3 ± 8.25	57.1 ± 12.3	14.1 ± 11.2	31.3 ± 20.2	33.6 ± 4.6	90.5 ± 2.4	66.7 ± 6.6	77.1 ± 4.7	
治疗后	16	8.4 ± 2.5 ^{ab}	93.0 ± 3.6 ^{ab}	8.1 ± 4.05 ^{ab}	21.5 ± 10.0 ^{ab}	43.4 ± 3.5 ^{ab}	18.4 ± 7.7 ^{ab}	4.2 ± 2.3 ^{ab}	96.5 ± 1.3 ^{ab}	93.1 ± 3.1 ^{ab}	13.8 ± 5.0 ^{ab}	
药物组												
治疗前	16	35.8 ± 22.9	73.7 ± 5.3	20.0 ± 8.14	55.4 ± 14.5	14.4 ± 10.5	30.0 ± 21.2	33.9 ± 4.1	90.8 ± 2.2	65.9 ± 2.1	76.8 ± 6.6	
治疗后	16	34.2 ± 16.1	75.7 ± 5.1	19.4 ± 9.16	50.2 ± 16.7	17.7 ± 9.6	33.4 ± 13.3	28.4 ± 10.7	92.8 ± 2.1	72.4 ± 6.1 ^a	69.8 ± 10.1 ^a	

注:与组内治疗前比较,^a $P < 0.05$;与药物组治疗后比较,^b $P < 0.05$

表 3 2 组患者治疗前、后颈椎周围肌肉力量比较($s, \bar{x} \pm s$)

组别	例数	前屈	后伸	左侧屈	右侧屈	左旋转	右旋转
训练组							
治疗前	16	106.1±13.3	108.6±17.0	72.4±11.7	79.2±12.4	70.7±16.4	71.1±16.0
治疗后	16	148.3±9.0 ^{ab}	155.0±20.5 ^{ab}	124.1±22.8 ^{ab}	125.1±23.5 ^{ab}	137.1±21.6 ^{ab}	133.7±23.5 ^{ab}
药物组							
治疗前	16	105.1±13.8	107.0±16.2	71.1±10.4	78.3±12.4	70.5±15.8	76.2±16.1
治疗后	16	106.2±11.0	112.0±14.7	69.7±12.2	79.2±13.2	71.8±17.0	74.7±15.6

注:与组内治疗前比较,^a $P < 0.05$;与药物组治疗后比较,^b $P < 0.05$

表 4 2 组患者治疗前、后颈椎活动度比较($^{\circ}, \bar{x} \pm s$)

组别	例数	前屈	后伸	左侧屈	右侧屈	左旋转	右旋转
训练组							
治疗前	16	23.3±4.8	26.8±3.4	31.4±4.7	30.8±4.3	17.2±3.1	16.9±3.2
治疗后	16	32.7±2.1 ^{ab}	34.6±1.3 ^{ab}	41.4±3.2 ^{ab}	43.0±2.1 ^{ab}	28.3±1.5 ^{ab}	27.3±2.9 ^{ab}
药物组							
治疗前	16	24.0±3.7	26.5±2.5	30.9±3.8	29.8±4.4	17.6±4.5	17.5±3.8
治疗后	16	26.1±2.8	27.3±3.0	29.3±4.2	30.3±2.3	16.8±4.2	16.4±4.5

注:与组内治疗前相比,^a $P < 0.05$;与药物组治疗后相比,^b $P < 0.05$

颌舌骨肌、二腹肌、胸锁乳突肌、膈肌、斜角肌及斜方肌等,这些肌肉在 PSG 上所反映出来的肌电振幅低于正常值,肌电积分偏低。研究认为,当肌肉受到炎症、疼痛及情绪刺激后,可能会发生强直性收缩或痉挛性反应,使肌肉变得粗短、僵硬,从而对呼吸道构成物理性挤压^[11]。黄陆颖等^[12]研究认为,肥胖患者颈部、咽部、舌和腭部咽腔有较多脂肪堆积,导致其咽腔变窄,在仰卧位睡眠状态下,咽部脂肪下坠及颈部脂肪压迫使狭窄的咽腔进一步塌陷闭塞,OSAHS 就此发生。郝慧等^[5]也认为,OSAHS 患者的上气道存在一个或几个阻塞点,阻塞易在咽腔解剖性狭窄处形成,周围软组织挤压可导致咽腔截面积变窄。从解剖学上观察到,呼吸道是由平滑肌组成的软性管道,由于缺少骨性结构支持,存在一定的可塌陷性。因此,不良挤压增大了对颈部、胸部、腹部及呼吸道周围组织的压力,当周围压力大于静脉压时,血液回流受阻,淋巴循环出现障碍,造成呼吸道自身、甲状软骨骨膜及环状软骨骨膜肿胀^[13]。吸气时出现的咽腔负压状态使咽气道软组织被动性塌陷,血液中血氧含量逐渐降低,二氧化碳分压逐渐升高,咽腔内负压增加,使机体出现呼吸困难和二氧化碳潴留。睡眠状态下,呼吸中枢对低氧及高二氧化碳刺激的反应不敏感,其化学反应性减弱^[14]。加之人体咽气道自身解剖结构上的缺陷,阻塞现象加重,睡眠结构出现紊乱。

OSAHS 患者颈部均存在不同程度的疼痛、异物感及发紧感,颈椎灵活度降低,各肌群之间的肌肉力量失衡。流行病学调查显示^[15-16],这种情况的出现可能与人们的工作生活方式相关,例如久坐于电脑前迫使颈椎长时间处于屈曲状态,颈前肌群如上颌舌骨肌、下颌舌骨肌、二腹肌、胸锁乳突肌、膈肌等变得粗短且僵硬,且长期处于被动缩短状态;颈椎两侧和项伸肌群如枕骨下肌、头最长肌、头半棘肌、头夹肌、颈夹肌及上背的肩胛提肌、斜方肌、菱形肌等,因需长期对抗颈椎的屈曲状态而被过度拉长,肌原纤维发生微细断裂,使肌肉间发生粘连肿胀,对呼吸道造成严重刺激,使骨膜附着处出现增生和瘢痕组织形成。有研究指出,颈部肌肉长时间疲劳后,造成局部缺血,肌内压增高,氧化代谢率降低,血中乳酸含量增加,氢离子排出率和 pH 值均降低,导致肌纤维神经传导速度下降,肌肉收缩力量减弱^[17]。

在骨骼肌骨膜附着处对其实行压揉,可起到解痉镇痛、拨离粘连、去除水肿、加速组织代谢的作用。通过对气道周围发生病变的骨骼肌进行压揉,可降低外周阻力,消除致痛物质对呼吸道的刺激和物理性挤压^[18]。抗阻力运动即肢体在主动运动中需克服外部阻力完成动作,其根本作用在于提高神经系统的调节代谢能力,增强机体的循环呼吸功能,维持并恢复运动

器官的形态与功能^[19]。弹力带运动可在不同方向负荷下对颈椎进行牵引,拉伸被缩短的肌肉,重建神经传导通路,恢复肌肉长度记忆^[20]。阻力运动可增强肌肉力量,矫正颈部肌群间的力量失衡情况,改善肌肉组织力学特性,从而恢复肌肉正常弹性,增大颈椎活动幅度,对人体局部及全身产生相应影响^[21-22]。

本研究结果显示,治疗后患者 OSAHS 症状明显减轻,已无嗜睡现象,浅睡眠比例相对减少,深睡眠比例增加,AN 次数明显减少,REM 睡眠占总睡眠时间的比例增加。52.3% 的患者转为单纯鼾症,AHI 指数 < 5; 47.7% 的患者 AHI 指数也降至 5~20 之间。患者白天工作时精神焕发、思维积极、对生活满意度增加。

综上所述,OSAHS 患者的睡眠结构、AHI 指数与颈椎功能的改变呈密切相关性,病变骨骼肌可对气道产生物理性挤压及刺激,骨膜压揉加抗阻力运动可显著改善患者的颈椎活动度及颈部肌肉力量,但 OSAHS 的作用机制及其与颈椎功能异常间的内在关系仍需进一步深入研究。

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- (修回日期: 2012-09-13)
(本文编辑: 凌 琛)

· 外刊摘英 ·

Memory function before and after stroke

A number of studies have reported that dementia and cognitive impairment are higher among stroke survivors than among age matched, stroke free adults. Recent evidence suggests that acute stroke follows a long period of accumulating cerebrovascular injury, possibly associated with subtle ischemic injury, silent stroke and stroke symptoms. This study used 10 years of data to describe the long-term pre- and post-stroke trajectories of memory function among stroke survivors.

Data were obtained from the Health and Retirement Study, a nationally representative cohort study initiated in 1992. Analysis for this paper included non-institutionalized Americans, 50 years of age or older in 1998. From among the participants, 18,987 who were stroke free at baseline were identified. The patients were interviewed twice yearly for up to 10 years. Memory was assessed with immediate and delayed recall tests, as well as by proxy informants using a five-item Likert scale and a 16-item version of the Informant Questionnaire for Cognitive Decline. At each interview, the patients were assessed for incident stroke.

Of the 17,340 patients included in the final analysis, 1,189 (6.9%) survived a stroke, while 385 (2.2%) experienced a stroke and did not survive. Among the stroke survivors, memory function significantly declined with each additional year of age, both before and after stroke, with a large decrement at the time of stroke onset. The average, annual pre-stroke memory decline was greater among those who did not survive the stroke as compared to those who did survive ($P < 0.001$). As the time of stroke onset approached, the decline of memory function accelerated. Compared with annual memory decline in stroke free participants, memory decline occurred most rapidly among those who experienced a fatal stroke, followed by those who survived a stroke ($P < 0.001$).

Conclusion: This study of elderly individuals found a faster memory decline in the years before stroke among stroke patients, compared with those who remain stroke free, with this decline accelerated among those who would suffer a fatal stroke.

【摘自: Wang Q, Capistrant BD, Ehntholt A, et al. Long-term rate of change in memory functioning before and after stroke onset. *Stroke*, 2012, 43: 2561-2566.】

Hip muscle strengthening and patellofemoral pain

Patellofemoral pain syndrome is a common overuse disorder, which is traditionally addressed by knee strengthening exercises and stretching. Some have suggested that strengthening of the hip musculature may also be important when addressing this condition.

This study assessed whether a hip strengthening program, in addition to a conventional knee exercise program, can improve the outcomes of these patients. Fifty-four sedentary women with unilateral patellofemoral pain syndrome were randomly assigned to either a knee exercise group (KE) or a knee and hip exercise group (KHE). The knee extension exercises were completed at 70% of the estimated one repetition maximum, involving knee flexion and extension exercises, as well as calf raises. The KHE group also performed hip abduction, adduction, lateral rotation and hip extension exercises. The patients were involved in 12 treatment sessions, three times per week for four weeks. Outcome measures included an 11-point numeric pain rating scale, along with the Lower Extremity Functional Scale and the Anterior Knee Pain Scale, completed at three, six and 12 months.

The KE subjects demonstrated decreased pain while ascending stairs at six months and while descending stairs at three and six months, and improved single hop test performance at three, six and 12 months after treatment. However, the KHE subjects demonstrated significantly less pain and showed improved function as compared to the KE group on all outcome measures at three, six and 12 months ($P < 0.05$ for all comparisons).

Conclusion: This study of sedentary females with patellofemoral pain syndrome found that supplementing knee strengthening exercises with hip abductor, lateral rotator and extensor strengthening exercises is more effective for improving function and reducing pain than is knee strengthening alone.

【摘自: Fukuda TY, Melo WP, Zaffalon BM, et al. Hip posterior lateral musculature strengthening in sedentary women with patellofemoral pain syndrome: a randomized, controlled clinical trial with one-year follow-up. *J Ortho Sports Phys Therapy*, 2012, 42: 823-830.】