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·综述·

脑卒中患者上肢活动状态与平衡及步行关系的研究进展

王 盛[1,2,3] 陈 昕[3] 王 彤[4,5]

对脑卒中患者平衡及步行影响因素的研究，一般会涉及躯干功能[1]、下肢运动功能[2]、本体感觉[3]与认知功能[2]等方面，却极少关注脑卒中后上肢与平衡、步行的交互作用。近年来，陆续有文献发表了相关的研究结果，现对其主要内容进行综述。

1 上肢活动状态与平衡功能的关系

1.1 上肢主动活动对平衡功能的影响

对站立平衡控制的研究，以往主要研究外部干扰力或不稳定的支撑面等外部因素对平衡的影响。近来开始有针对躯体自身运动这类内在干扰因素对平衡影响的研究。Garland SJ等[4]首次比较了年轻人、老年人、脑卒中患者在站立位下的手臂主动活动对姿势控制的影响，发现年轻人在站立位一侧手臂向前摆动时，会产生最大的手臂屈曲加速度和最小的人体压力中心（center of pressure, CP）偏移速度，说明年轻人手臂摆动时有较好的平衡调节能力，这个能力也保证

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1 南京医科大学附属苏州医院，苏州，215002；2 苏州科技城医院；3 南京医科大学；4 南京医科大学第一附属医院；5 通讯作者
作者简介：王盛，男，博士研究生，中级技师；收稿日期：2016-06-09

了手臂运动的快速完成;老年人则表现出较大的个体姿势反应差异性;而偏瘫患者即使已过急性期且Berg平衡量表(Berg balance scale, BBS)评分较高,当他健侧手臂向前摆动时,依然可见三者中其CP偏移速度最大和手臂加速度最小,提示偏瘫患者在进行上肢运动时可能需要更多的躯干重心偏移来维持平衡,同时平衡能力的不足也制约了上肢的活动。

三组人群在直立向前摆臂时都呈现出同侧腘绳肌爆发式活动,偏瘫组除腘绳肌外其他腿后肌群的潜伏期和活动幅度均有减少。这说明偏瘫患者不能有效地协调姿势性腿部肌群活动与上肢局部运动,导致姿势不稳定,但这一现象的机制研究仍需深入进行。

1.2 限制上肢活动对平衡功能的影响

近年来有多篇文献探讨不同类型手臂吊带限制患侧上肢活动后给平衡带来的影响。

Acar M等[5]研究发现手臂吊带的使用能提高肩关节半脱位的偏瘫患者的BBS、静态平衡指数和功能性够取测试的成绩因此建议在脑卒中偏瘫上肢尚处于软瘫期时,可使用手臂吊带减少手臂摆动,提高患者稳定性。Sahin E等[6]也发现在使用吊带后患者的平衡能力显著提高。而另一项研究[7],在比较三种吊带(无吊带、Bobath腋部支撑带及简单的网袋式吊带)的研究中却得出相反结论,即无论何种肩部支持方式,偏瘫脑卒中患者重心向右和后偏移的不对称模式都没有改善。在静态和动态平衡测试中,佩戴吊带不能改善患者的平衡参数。

2 上肢活动状态对步行功能的影响

2.1 上肢摆动对步行功能的影响

健康人自然行走时,手臂的摆动方向与下肢迈步方向相反并保持相同频率[8]。限制手臂运动会影响到步态模式[9—10],Stephenson JL等[11]发现,在脑卒中患者步行的支撑相早期,上肢不摆动时,患侧下肢胫前肌的激活最大;上肢自由摆动时,大腿近端肌肉(股四头肌、半腱肌)激活增加,并且比目鱼肌的激活最大;在步行摆动早期,上肢摆动时胫前肌的激活最大;可见卒中患者步行时上肢如果能自由摆动,则其步态最接近正常;所以有建议将手臂运动纳入步态训练中[9—10]。然而,因为很多患者上肢功能较差,不足以形成手臂的自由运动,所以难以产生实际的作用。Stephenson[12]采用一种独特的滑动杆装置,使患者手臂在一定的支持辅助下产生前后的摆动。研究发现功能较好的脑卒中患者在上肢支持辅助下所获得的有关上下肢协调性指标与健康人相同,说明上肢摆动所致的姿势稳定性改变,会影响下肢相关肌群的激活,改善患者上肢的摆动可能改善步态。但Yavuzer等[13]的研究对这一观点并不持支持态度,他发现用肩吊带限制上肢摆动对健康人的步态没有影响,但可改善脑卒中患者的步态模式(运动学和动力学参数)、步速、患腿支撑相时间,双支撑相时间、重心偏移、患腿的承重。限制上肢不仅能改善脑卒中患者的步态模式,而且能提高步行的能量效率[14]。手臂吊带有助于提高步行速度,降低行走中的心率,摄氧速率显著下降7%,不使用手臂吊带的患者耗氧量是使用手臂吊带患者的1.4倍。研究发现[15]偏瘫患者患侧上肢佩戴弹力手臂吊带步行时,步频、步速、步长均显著改善。建议治疗师应该使用弹力手臂吊带作为一个步态训练的辅助工具改善步行功能。

2.2 上肢屈曲痉挛模式对步行功能的影响

上肢屈曲痉挛是卒中后的常见状态。研究发现[16—17],用肉毒毒素注射的方法改善偏瘫患者屈肘痉挛后,部分患者随着屈肘角度的改善,膝关节活动度也会有所增加,步速也会有所加快。Esquenazi A等[18]对15例患者的患侧肱二头肌、肱肌/肱桡肌注射120—200U肉毒毒素,发现注射后上肢肌群的改良Ashworth评分从2.6减少到1.4,步速从0.56m/s增加到0.63m/s。Hirsch MA等[19]也发现,进行患侧上肢屈肌痉挛肉毒毒素的治疗后,迈步时间较长的患者能显著减少步行中患侧的迈步时间,增大膝踝的活动范围;而对于迈步时间本就较短的患者而言未表现出显著差异。

这些研究提示,偏瘫上肢肘屈曲痉挛模式,会限制步行能力,有针对性的降低屈肘痉挛程度,可能有助于步行能力的改善。

3 上肢功能与躯干稳定的相互作用

躯干在平衡稳定中起着整合的作用[20],因此躯干的稳定和控制被认为是保证上肢功能和手功能正常使用的必要条件[21]。脑卒中会影响躯干肌肉的控制,破坏身体的直立和重心的转移,损害姿势的静态和动态平衡调节及稳定性[22]。大量的研究表明脑卒中患者在上肢目标导向任务和够取任务中会出现躯干的过度活动[23—27],当肩和肘的运动和控制受损时,会用躯干代偿的运动策略去伸展手臂。过度的代偿运动会导致继发性肌肉挛缩、关节对线不良、疼痛、肢体失用和能量消耗增加影响上肢功能恢复。

有不少对代偿性躯干运动的研究发现,在上肢治疗中避免代偿性躯干运动的产生可以改善上肢功能[28—36]。如用腰部束缚带将躯干及骨盆完全固定在座椅上,能激发出更多的正常上肢运动。以往研究采用是胸部束缚带,Wee SK[36]认为这种方式存在一定的缺陷,在保证躯干稳定的同时也限制了躯干的活动,所以改用腰部束腹带的方式,研究发现新方法能显著提高偏瘫侧上肢功能[简化Wolf运动功能量表(streamlined Wolf motor function test,SWMFT)及其功能能力评分(functional ability scale)]。但新近的meta分析研究发现,FMA上肢评分(Fugl-Meyer upper extremity,FMA-UE)、肩关节主动屈曲、躯干位移[38]与肘关节伸展[39]之间具有

显著的效应,但限制躯干活动对上肢功能[38](action research arm test, ARAT),WMFT,和(box and block test, BBT)的影响很小没有显著性意义。所以,目前的研究没有足够的证据支持限制躯干的活动能改善慢性脑卒中患者上肢功能。

综上所述,对不同时期及功能状态的脑卒中患者,上肢采用不同的策略能改善患者的平衡及步行功能:①行走时对偏瘫上肢辅助支持摆动能改善步行功能;②对上肢软瘫的状况采用手臂吊带限制上肢的摆动可提高平衡和步行能力;③对于上肢屈肌痉挛的患者可用肉毒毒素减轻上肢的屈曲痉挛程度提高平衡和步行功能;这些治疗方式在临床中也存在一些弊端,对上肢恢复而言可能并不是积极主动的方式;有些患者肉毒毒素注射后屈曲模式还会再出现。在考虑对上肢功能恢复的干预方式时,减少代偿性躯干活动的参与,可能对改善上肢的功能活动是有帮助的。

近期关于脑瘫的研究为我们研究上肢与平衡、步态关系及如何制定康复治疗计划提供新的思路;研究认为,脑瘫儿童步行时手臂姿势的改变是与步行不稳定相关的,手臂的固有模式是一种为了维持平衡的代偿[40]。而我们在临床中经常见到的一个现象是患者在仰卧位上肢肌张力不高,没有明显的张力增高或屈曲模式,但是一旦实现站立位或行走,就会出现这种异常的表现,我们称之为痉挛或联合反应,这些均说明上肢和平衡、步行活动之间存在着相互的影响与作用。我们以往在关注平衡调节中的下肢踝策略、髋策略及迈步策略时,并未关注甚至忽略了上肢功能在平衡调节和步行活动中所起到的作用,阐明脑卒中上肢功能、平衡和步行功能障碍三者之间的关系与影响对指导脑卒中上肢功能训练、平衡训练、步行训练促进功能改善十分必要,值得我们进一步的深入研究。

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