

doi: 10.13241/j.cnki.pmb.2019.16.014

Centerpiece 微型钛板固定与传统丝线悬吊在颈椎后路单开门椎管扩大成形术中的应用效果比较研究 *

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摘要 目的:比较 Centerpiece 微型钛板固定与传统丝线悬吊在颈椎后路单开门椎管扩大成形术中的应用效果。**方法:**选取于 2015 年 2 月~2017 年 9 月期间北京大学第一医院收治的拟行颈椎后路单开门椎管扩大成形术的脊髓型颈椎病患者 169 例,根据治疗方式的不同将患者分为悬吊组($n=87$,给予传统丝线悬吊治疗)和钛板组($n=82$,给予 Centerpiece 微型钛板固定治疗),比较两组手术时间、术中出血量、术后颈椎疼痛时间、术后再关门发生率、轴性症状评分、日本骨科协会量表(JOA)评分、颈椎活动度、颈椎管矢状径、颈椎管横截面积、颈椎曲度、开门角度。**结果:**两组患者手术时间、术中出血量比较差异无统计学意义($P>0.05$),钛板组术后颈椎疼痛时间明显短于悬吊组,术后再关门发生率低于悬吊组($P<0.05$)。两组患者术后 2 个月、末次随访 JOA 评分均高于术前,且钛板组高于悬吊组($P<0.05$),两组患者末次随访轴性症状评分高于术后 2 个月,且钛板组术后 2 个月、末次随访轴性症状评分均高于悬吊组($P<0.05$)。与悬吊组相比,钛板组术后 2 个月、末次随访颈椎活动度、颈椎管矢状径升高($P<0.05$);而钛板组术后 2 个月颈椎管横截面积小于悬吊组,末次随访颈椎管横截面积大于悬吊组($P<0.05$)。悬吊组末次随访颈椎曲度小于术前、术后 2 个月($P<0.05$),钛板组手术前后颈椎曲度比较差异无统计学意义($P>0.05$);钛板组术后 2 个月、末次随访颈椎曲度、开门角度均大于悬吊组($P<0.05$)。**结论:**颈椎后路单开门椎管扩大成形术中应用 Centerpiece 微型钛板固定比传统丝线悬吊治疗的临床效果更好,可有效维持患者颈椎功能及活动度,并能改善神经功能。

关键词:颈椎病;微型钛板;单开门;椎管扩大成形术;丝线悬吊

中图分类号:R681.55 文献标识码:A 文章编号:1673-6273(2019)16-3080-05

The Application Effect Comparative Study of Centerpiece Mini-titanium Plate Fixation and Traditional Silk Thread Suspension in Posterior Single-door Laminoplasty for Cervical Vertebral Canal Enlargement*

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ABSTRACT Objective: To compare the application effect of Centerpiece mini-titanium plate fixation and traditional silk thread suspension in posterior single-door laminoplasty for cervical vertebral canal enlargement. **Methods:** 169 patients with cervical spondylotic myelopathy who were admitted to the First Hospital of Peking University from February 2015 to September 2017 were selected to undergo posterior single-door laminoplasty for cervical vertebral canal enlargement. The patients were divided into suspension group ($n=87$, traditional silk thread suspension therapy) and titanium plate group ($n=82$, Centerpiece mini-titanium plate fixation therapy) according to the different treatment methods. The operation time, intraoperative bleeding volume, post-operative cervical pain time, post-operative reopening rate, axial symptoms score, Japanese Orthopaedic Association (JOA) scale score, cervical mobility, sagittal diameter of cervical spinal canal, cross-sectional area of cervical spinal canal, cervical curvature and opening angle were compared between the two groups. **Results:** There were no significant differences in operation time and intraoperative bleeding volume between the two groups ($P>0.05$). The post-operative cervical pain time, in the titanium plate group was significantly shorter than that in the suspension group, and the post-operative reopening rate was lower than that in the suspension group ($P<0.05$). The JOA scores of the two groups at 2 months after operation and the last follow-up were higher than those before operation, and those of the titanium plate group were higher than those of the suspension group ($P<0.05$). The axis symptoms score of the last follow-up in two groups was higher than that of 2 months after operation, and the axis symptoms score of the titanium plate group were higher than those of the suspension group at 2 months after operation and the last follow-up ($P<0.05$). Compared with the suspension group, the cervical mobility, sagittal diameter of cervical spinal canal in the titanium plate group increased at 2 months after operation and the last follow-up ($P<0.05$). The cross-sectional area of cervical spinal canal in the titanium plate group was smaller than that in the suspension group at 2 months after operation, and the cross-sectional area of cervical spinal canal in the last follow-up was larger than that in the suspension group ($P<0.05$).

* 基金项目:北京市科技计划资助项目(Z1511009410607)

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(收稿日期:2019-01-24 接受日期:2019-02-18)

The cervical curvature of the last follow-up in the suspension group was less than that before operation and 2 months after operation ($P < 0.05$). There was no significant difference in cervical curvature before and after operation in titanium plate group ($P > 0.05$). The cervical curvature and opening angle of the titanium plate group were greater than those of the suspension group at 2 months after operation and the last follow-up ($P < 0.05$). **Conclusion:** Centerpiece mini-titanium plate fixation in posterior single-door laminoplasty for cervical vertebral canal enlargement is more effective than traditional silk thread suspension. It can effectively maintain cervical spine function and mobility, and improve nerve function.

Key words: Cervical spondylotic; Mi-ni titanium plate fixation; Single-door; Laminoplasty; Silk thread suspension

Chinese Library Classification(CLC): R681.55 **Document code:** A

Article ID: 1673-6273(2019)16-3080-05

前言

脊髓型颈椎病是由于颈椎椎骨间连接结构退变,致使脊髓受压或脊髓缺血,进而出现脊髓功能性障碍^[1,2]。颈椎后路单开门椎管扩大成形术是治疗该病的主要方法,以往临床多采用传统丝线悬吊固定开门侧的椎板,虽可获得一定的疗效,但该固定方式存在顽固的椎板内陷而出现神经损伤、颈椎轴性症状、可能再关门等不足^[3-5]。而微型钛板的出现则较好地解决了传统丝线悬吊固定方式的缺陷。Centerpiece 微型钛板是美敦力公司为颈椎后路单开门椎管扩大成形术设计并生产的专用微型钛板,具有良好的韧性、强度及生物相容性^[6,7]。本研究就我院收治的行颈椎后路单开门椎管扩大成形术的脊髓型颈椎病患者 169 例,分别给予 Centerpiece 微型钛板固定与传统丝线悬吊,对其临床疗效进行分析,以期为临床治疗提供数据支持。

1 资料与方法

1.1 一般资料

选取于 2015 年 2 月~2017 年 9 月期间北京大学第一医院收治的拟行颈椎后路单开门椎管扩大成形术的脊髓型颈椎病患者 169 例。纳入标准:(1)经影像学诊断为脊髓型颈椎病,临床表现为颈痛、手臂麻木、步态改变以及行走乏力等;(2)入院前未接受过其他治疗者;(3)符合手术指征者;(4)患者及其家属知情本次研究,已签署知情同意书。排除标准:(1)伴有严重骨质疏松者;(2)颈椎生理性前凸消失者;(3)颈椎明显失稳者;(4)合并肩周炎等影响轴性症状判断者;(5)颈椎疾病前后路联合手术者。根据治疗方式的不同将患者分为悬吊组($n=87$)和钛板组($n=82$),其中悬吊组男 46 例,女 41 例,年龄 45~76 岁,平均(57.68 ± 3.91)岁;病程 7 个月~5 年,平均(2.13 ± 1.08)年;其中发育性颈椎管狭窄症 29 例,多节段脊髓型颈椎病 31 例,颈椎后纵韧带骨化症 27 例。钛板组男 44 例,女 38 例,年龄 43~75 岁,平均(58.32 ± 4.08)岁;病程 5 个月~6 年,平均(2.06 ± 0.89)年;其中发育性颈椎管狭窄症 27 例,多节段脊髓型颈椎病 31 例,颈椎后纵韧带骨化症 24 例。两组患者基线资料比较无差异($P > 0.05$),均衡可比。

1.2 治疗方法

患者全麻,取俯卧位,固定头部,于颈后正中作一切口,往棘突两边骨膜下剥离以暴露椎板,分离 $C_2 \sim T_1$ 椎板及椎板间隙,采用咬骨钳咬除 C_{3-7} 处棘突,选取神经症状较为严重的一侧为开门侧,症状较轻侧为门轴侧,再用高速磨钻行开门侧开槽,同时磨透全层椎板,于门轴侧开槽打磨至内侧骨皮质,然后

向门轴侧完整掀起 C_{3-7} 椎板用于扩大狭窄椎管,咬骨钳切除清理黄韧带并分离硬脊膜上的粘连带以充分减压。悬吊组在开门前先在棘突基底部打孔以方便粗丝线贯穿,于门轴侧 C_{3-7} 侧块中植入直径 3.5 毫米的钛螺钉,将悬吊丝线固定于钛螺钉上,钛板组则将 Centerpiece 微型钛板一端用于固定掀起的椎板,另一端用于侧块固定,最后两端用螺钉固定。术中注意保持 C_{3-7} 椎板间黄韧带以及棘间韧带的完整性,术后常规放置负压引流管,缝合切口。术后 1~2d 视引流量情况拔除引流管,钛板组术后佩戴颈部围领制动 2 周,悬吊组术后佩戴颈部围领 12 周,术后视患者具体情况行常规康复训练。术后采用电话回访或者门诊复查等方式随访一年,所有患者均获得随访。

1.3 观察指标

比较两组患者手术时间、术中出血量、术后颈椎疼痛时间、术后再关门发生率。于术前、术后 2 个月、末次随访采用日本骨科协会量表(Japanese Orthopaedic Association, JOA)^[8]评分对患者神经功能进行评定,主要包括上肢功能、下肢功能、上肢感觉、下肢感觉、躯干感觉、膀胱功能,总分 17 分,分数越高,其神经功能恢复越好。于术后 2 个月、末次随访使用日本庆应大学整形外科的 12 分法对患者轴性症状进行量化评价^[9],该量表包括颈后部疼痛、颈后部僵硬、肩部疼痛、肩部僵硬,其中无症状(3 分)、轻微(2 分)、偶尔严重(1 分)、持续存在(0 分),分数越高,其轴性症状越轻。测定两组患者术前、术后 2 个月、末次随访颈椎活动度、颈椎管矢状径、颈椎管横截面积、颈椎曲度,其中过屈位下 C_2 、 C_7 椎体后缘连线夹角的差值定义为颈椎活动度;摄 X 线片及 CT 测量颈椎管矢状径、颈椎管横截面积;以 C_2 与 C_7 椎体后壁切线夹角为颈椎曲度;取水平横断面平扫 CT,将门轴作为顶点,向开门两边作射线,射线所形成的夹角即为椎板开门角度,比较两组术后 2 个月、末次随访的开门角度。

1.4 统计学方法

研究数据录入 SPSS26.0 软件处理,计量资料用($\bar{x} \pm s$)表示,采用 t 检验,计数资料以率(%)表示,采用 χ^2 检验, $\alpha=0.05$ 设置成检验标准。

2 结果

2.1 两组患者临床情况比较

两组患者手术时间、术中出血量比较差异无统计学意义($P > 0.05$);钛板组术后颈椎疼痛时间明显短于悬吊组,术后再关门发生率低于悬吊组($P < 0.05$),详见表 1。

表 1 两组患者临床情况比较

Table 1 Comparison of clinical situation between two groups of patients

Groups	Operative time(min)	Intraoperative bleeding	Post-operative cervical pain	Post-operative reopening
		volume(ml)	time(weeks)	rate(%)
Suspension group(n=87)	101.25± 15.19	407.83± 26.71	20.31± 1.93	5(5.75)
Titanium plate group(n=82)	103.92± 16.41	413.54± 27.52	6.95± 0.87	0(0.00)
χ^2/t	1.098	1.369	57.419	4.856
<i>P</i>	0.274	0.173	0.000	0.028

2.2 两组患者轴性症状评分、JOA 评分比较

两组患者术前 JOA 评分比较差异无统计学意义($P>0.05$); 两组患者术后 2 个月、末次随访 JOA 评分均高于术前,且钛板

组高于悬吊组($P<0.05$);两组患者末次随访轴性症状评分高于术后 2 个月,且钛板组术后 2 个月、末次随访轴性症状评分均高于悬吊组($P<0.05$),详见表 2。

表 2 两组患者轴性症状评分、JOA 评分比较($\bar{x}\pm s$,分)

Table 2 Comparison of axis symptom score and JOA score between the two groups($\bar{x}\pm s$, scores)

Groups	JOA score			Axis symptom score	
	Before operation	2 months after operation	Last follow-up	2 months after operation	Last follow-up
Suspension group(n=87)	7.91± 1.31	11.88± 1.29*	12.42± 1.91* [#]	9.36± 1.42	9.90± 1.57 [#]
Titanium plate group(n=82)	7.88± 1.14	12.55± 1.37*	13.15± 1.78* [#]	9.82± 1.37	10.69± 1.63 [#]
<i>t</i>	0.158	3.274	2.566	2.141	3.209
<i>P</i>	0.874	0.001	0.011	0.034	0.002

Note: Compared with before operation,* $P<0.05$; compared with 2 months after operation,[#] $P<0.05$.

2.3 两组患者颈椎活动度、颈椎管矢状径、颈椎管横截面积比较

两组患者术前颈椎活动度、颈椎管矢状径、颈椎管横截面积比较差异无统计学意义($P>0.05$);与术前相比,两组患者术后 2 个月、末次随访颈椎活动度降低,颈椎管矢状径、颈椎管横截面积升高($P<0.05$);与术后 2 个月相比,两组患者末次随访

颈椎活动度升高,颈椎管矢状径、颈椎管横截面积降低($P<0.05$);与悬吊组相比,钛板组术后 2 个月、末次随访颈椎活动度、颈椎管矢状径升高($P<0.05$);而钛板组术后 2 个月颈椎管横截面积小于悬吊组,末次随访颈椎管横截面积大于悬吊组($P<0.05$);详见表 3。

表 3 两组患者颈椎活动度、颈椎管矢状径、颈椎管横截面积比较($\bar{x}\pm s$)

Table 3 Comparison of cervical mobility,sagittal diameter of cervical spinal canal and cross-sectional area of cervical spinal canal between the two groups($\bar{x}\pm s$)

Groups	Cervical mobility(°)			Sagittal diameter of cervical spine canal (mm)			Cross-sectional area of cervical spinal canal (mm ²)		
	Before operation	2 months after operation	Last follow-up	Before operation	2 months after operation	Last follow-up	Before operation	2 months after operation	Last follow-up
Suspension group(n=87)	49.19± 3.65	38.67± 3.95*	40.13± 5.25* [#]	8.53± 1.87	15.23± 2.04*	13.24± 2.57* [#]	148.09± 30.94	322.31± 43.69* [#]	256.63± 54.05* [#]
Titanium plate group (n=82)	49.26± 4.02	40.14± 4.79*	42.53± 4.36* [#]	8.58± 1.95	17.29± 2.15*	15.85± 2.31* [#]	147.98± 29.87	291.67± 48.71* [#]	273.65± 57.36* [#]
<i>t</i>	0.119	2.182	3.223	0.170	6.381	6.951	0.023	4.310	1.986
<i>P</i>	0.906	0.031	0.002	0.865	0.000	0.000	0.981	0.000	0.049

Note: Compared with before operation,* $P<0.05$; compared with 2 months after operation,[#] $P<0.05$.

2.4 两组颈椎曲度、开门角度比较

两组患者术前颈椎曲度比较差异无统计学意义($P>0.05$);悬吊组末次随访颈椎曲度小于术前、术后 2 个月($P<0.05$),钛

板组手术前后颈椎曲度比较差异无统计学意义($P>0.05$);钛板组术后 2 个月、末次随访颈椎曲度、开门角度均大于悬吊组($P<0.05$);详见表 4。

表 4 两组颈椎曲度、开门角度比较($\bar{x} \pm s, ^\circ$)Table 4 Comparison of cervical curvature and opening angle between the two groups($\bar{x} \pm s, ^\circ$)

Groups	Cervical curvature			Opening angle	
	Before operation	2 months after operation	Last follow-up	2 months after operation	Last follow-up
Suspension group (n=87)	17.17 $\pm$ 2.31	16.09 $\pm$ 0.20	15.27 $\pm$ 2.14*#	31.43 $\pm$ 4.24	31.51 $\pm$ 3.53
Titanium plate group (n=82)	17.22 $\pm$ 2.30	17.92 $\pm$ 3.03	17.98 $\pm$ 2.63	33.42 $\pm$ 3.62	33.44 $\pm$ 3.48
t	0.141	2.550	7.366	3.272	3.577
P	0.888	0.012	0.000	0.001	0.000

Note: Compared with before operation, * $P < 0.05$; compared with 2 months after operation, # $P < 0.05$.

3 讨论

脊髓型颈椎病是由于脊髓受到压迫或脊髓滋养血管,引起脊髓缺血致脊髓功能逐步丧失^[10-12]。该病临床表现为颈肩部麻木刺痛、下肢无力以及步态蹒跚等症状,严重者可致残,给患者生活质量带来严重影响^[13,14]。临床研究表明^[15],70%~80%的脊髓型颈椎病有逐渐加重的特点,因此,患者一旦确诊为脊髓型颈椎病,应尽早考虑手术治疗。颈椎后路单开门椎管扩大成形术可直接解除来自脊髓后方的压迫^[16-18]。传统丝线悬吊是该术式的传统固定方法,然而该固定方式牢固性一直饱受质疑,同时该固定方式术后需长时间颈围领制动,造成颈后部肌肉萎缩、粘连,轴性症状发生率较高^[19-21]。Centerpiece 微型钛板固定是近年来针对该术式专制的固定方式,其安装简单安全,逐渐受到临床医师的青睐^[22,23]。

本次研究结果表明,两组患者手术时间、术中出血量比较无差异,表明两种术式安装过程难度相当,可获得类似的手术效果。同时钛板组在术后颈椎疼痛时间、术后再关门发生率等方面优于悬吊组,这主要是因为 Centerpiece 微型钛板固定技术将具有支撑作用的微型钛板安置在掀起的椎板及同侧形成稳定的桥接结构,有效防止术后“再关门”现象^[24]。此外,稳定的固定有利于早期术后颈部活动,有效减少术后颈椎疼痛时间^[25]。本研究结果还显示,Centerpiece 微型钛板更有利于机体神经功能恢复,同时钛板组术后 2 个月、末次随访轴性症状评分均高于悬吊组,这可能是由于传统丝线悬吊易损伤颈后肌肉原有韧带,进而影响颈椎稳定性,另外该固定方法术后需长时间制动,影响颈椎恢复,而 Centerpiece 微型钛板固定无需长时间制动,可尽早行功能锻炼,减少术后轴性症状情况,有效恢复患者神经功能^[27,28]。本研究中经 Centerpiece 微型钛板固定患者的颈椎活动度、颈椎管矢状径、颈椎管横截面积、颈椎曲度、开门角度的变化情况均优于传统丝线悬吊治疗的患者,这可能是由于 Centerpiece 微型钛板重建的椎板,结构与颈椎后柱类似,在生物力学上更贴近颈椎生理特征,减少了椎管扩大成形术对患者颈椎的影响,有效维持上述指标变化稳定^[29,30]。此外,本研究的不足之处在于病例选择有限,样本量偏少,且仅随访 1 年,远期 Centerpiece 微型钛板是否会发生松动、移位或者疲劳断裂引发“再关门”现象等情况仍需做进一步随访报道。

综上所述,相较于传统丝线悬吊固定,颈椎后路单开门椎

管扩大成形术中应用 Centerpiece 微型钛板固定,可维持椎管稳定性,改善神经功能,较好地维持患者颈椎活动度。

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