

• 血管内治疗 •

串联病变对急性前循环大血管闭塞性缺血性
脑卒中血管内治疗预后的影响

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【摘要】 目的 探讨串联病变对急性前循环大血管闭塞性缺血性脑卒中血管内治疗预后的影响。**方法** 收集 2021 年 6 月 - 2022 年 9 月在阜阳市人民医院接受急性期血管内治疗的前循环大血管闭塞性缺血性脑卒中患者的临床资料,应用二分类 Logistic 回归分析串联病变对前循环大血管闭塞性缺血性脑卒中血管内治疗预后的影响。**结果** 本研究共入组 14 例(15.56%)串联病变患者,其中 11 例(78.57%)发病机制为动脉粥样硬化,3 例(21.43%)为血管夹层;10 例(71.43%)采用逆行开通的方法,11 例(78.57%)同期行颈动脉支架植入,3 例(21.43%)合并出血性转化,12 例(85.71%)实现完全血管再通,6 例(42.86%)预后良好;二分类 Logistic 回归分析显示,串联病变($OR = 1.119, 95\%CI = 0.182 \sim 6.880, P = 0.903$)对急性前循环大血管闭塞性缺血性脑卒中血管内治疗的预后无显著影响,而基线美国国立卫生研究院卒中量表(National institute of health stroke scale, NIHSS)评分高($OR = 1.230, 95\%CI = 1.099 \sim 1.377, P < 0.001$)、穿刺至血管再通时间长($OR = 1.034, 95\%CI = 1.010 \sim 1.059, P = 0.006$)和出血性转化($OR = 22.326, 95\%CI = 2.673 \sim 186.474, P = 0.004$)是导致其神经功能结局转归不良的独立危险因素。**结论** 串联病变对急性前循环大血管闭塞性缺血性脑卒中血管内治疗的预后无显著影响,而基线 NIHSS 评分高、穿刺至血管再通时间长和出血性转化是导致其转归不良的独立危险因素。

【关键词】 前循环串联病变 颈动脉支架植入 血管再通 出血性转化 预后

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Effect of tandem lesion on the prognosis of endovascular treatment for acute anterior circulation large vessel occlusion ischemic stroke Zhang Yan, Wang Youmeng, Wang Fuxing, et al. Fuyang People's Hospital, Fuyang Anhui 236000

【Abstract】 Objective To explore effect of tandem lesion on the prognosis of endovascular treatment for acute anterior circulation large vessel occlusion ischemic stroke. **Methods** The clinical data of patients with anterior circulation large vessel occlusive ischemic stroke who received acute endovascular treatment in Fuyang People's Hospital from June 2021 to September 2022 were collected. Binary logistic regression was applied to analyze the impact of tandem lesion on the prognosis of endovascular treatment for acute anterior circulation large vessel occlusion ischemic stroke. **Results** In this study, 14 patients (15.56%) with tandem lesions were enrolled. Among them, 11(78.57%) had atherosclerosis as the pathogenesis, 3 (21.43%) had vascular dissection, 10 (71.43%) had retrograde patency, 11 (78.57%) had carotid stent implantation at the same time, 3 (21.43%) had hemorrhagic transformation, 12 (85.71%) had complete vascular recanalization, and 6 (42.86%) had good prognosis. The results of binary logistic regression analysis showed that tandem lesions ($OR = 1.119, 95\%CI = 0.182 \sim 6.880, P = 0.903$) had no significant impact on the prognosis of endovascular treatment for acute anterior circulation large vessel occlusion ischemic stroke. The high baseline NIHSS score ($OR = 1.230, 95\%CI = 1.099 \sim 1.377, P < 0.001$), long time from puncture to vascular recanalization ($OR = 1.034, 95\%CI = 1.010 \sim 1.059, P = 0.006$), and hemorrhagic transformation ($OR = 22.326, 95\%CI = 2.673 \sim 186.474, P = 0.004$) are independent risk factors for poor neurological outcomes. **Conclusion** Tandem lesion have no significant impact on the prognosis of endovascular treatment for acute anterior circulation large vessel occlusion ischemic stroke, while high baseline NIHSS score, long puncture to vessel recanalization

time, and hemorrhagic transformation are independent risk factors for poor prognosis.

【Key words】 Anterior circulation tandem lesion Carotid artery stent implantation Vascular recanalization Hemorrhagic transformation Prognosis

急性大血管闭塞是导致缺血性脑卒中患者致残和死亡的重要原因,串联病变(Tandem lesion, TL)作为其中的一种类型,定义为颅内血管闭塞的同时合并颅外段血管重度狭窄或闭塞,约占所有大血管闭塞性缺血性脑卒中的10%~20%^[1-2]。有研究表明,TL患者静脉溶栓后成功血管再通率仅有9%,是神经功能结局预后不良的独立危险因素^[3-4]。已经证实血管内治疗比单纯药物治疗前循环大血管闭塞性缺血性脑卒中更为有效^[5],与单纯颅内动脉闭塞以及颈内动脉闭塞患者相比,TL因其自身的病理生理机制,在处理颅内闭塞血管的同时还要考虑颅外段血管,这是否对急性前循环大血管闭塞性缺血性脑卒中血管内治疗的预后产生不良影响,需要进一步探讨,以期临床提供参考。

1 对象与方法

1.1 研究对象

选取2021年6月-2022年9月在阜阳市人民医院接受急性期血管内治疗的前循环大血管闭塞性缺血性脑卒中患者。入组标准:(1)年龄18岁及以上;(2)术前美国国立卫生研究院卒中量表(National institutes of health stroke scale, NIHSS)评分 ≥ 6 分,改良Rankin量表(Modified Rankin scale, mRS)评分 ≤ 2 分;(3)经过数字减影血管造影(Digital subtraction angiography, DSA)、磁共振血管造影和(或)计算机X线断层扫描(Computed tomography, CT)血管造影证实为前循环大血管闭塞;(4)发病时间在24 h内。排除标准:(1)慢性颈内动脉或者颅内动脉闭塞患者;(2)后循环大血管闭塞;(3)头颅CT检查发现脑出血者;(4)心、肝、肺、肾功能等重要脏器功能不全且无法耐受手术者;(5)因严重心力衰竭、肺部感染、尿毒症等其他相关并发症导致患者死亡者。

1.2 方法

1.2.1 一般资料收集 采集患者性别、年龄、高血压病、糖尿病、心房颤动、基线NIHSS评分、静脉溶栓、穿刺至血管再通时间、术后改良脑梗死溶栓血流(Modified thrombolysis in cerebral infarction, mTICI)分级、mRS评分、术后颅内出血转化等。

1.2.2 治疗 如果脑卒中发作在4.5~6 h以内,患者或家属同意静脉溶栓,则给予阿替普酶0.6~0.9 mg/kg或者尿激酶100~150万单位静脉溶栓,同时桥接血管内治疗。手术过程:(1)在局部或者全身麻醉下行股动脉穿刺,置入8F血管鞘,6F Neuromax长鞘或者8F Guiding置于颈总动脉远端,建立血管内治疗通路;(2)依据发病机制对闭塞血管采取个体化治疗,进行血栓抽吸或者支架取栓,残余狭窄70%以上时考虑行支架植入或者单纯球囊扩张;(3)对于TL患者采取顺行(优先处理颅外段病变血管,再行开通颅内闭塞动脉)或者逆行的方法实现血管再通,如无明显禁忌则同期行颅外段支架植入;(4)如行支架植入,术中需给予替罗非班10~25 $\mu\text{g/kg}$,术后依据复查头颅CT表现,静脉泵入0.1~0.15 $\mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ 维持24~48 h,术后24 h再次复查头颅CT表现,如无出血性转化,在服用双联抗血小板聚集药物后4~6 h停用替罗非班。至少连续口服3个月阿司匹林100 mg/d和氯吡格雷75 mg/d,之后改为阿司匹林100 mg/d或者氯吡格雷75 mg/d长期维持。

1.2.3 评价指标 前循环TL定义为颈内动脉末端、大脑中动脉M1/M2闭塞合并同侧颅外段颈内动脉重度狭窄(70%及以上)或闭塞。根据mTICI分级判断血管内治疗后血流恢复情况^[6],其中2b级或3级则为成功血管再通。根据复查头颅CT或者磁共振成像(Magnetic resonance imaging, MRI)表现判断有无颅内出血性转化(Hemorrhagic transformation, HT)。mRS评分评估患者神经功能结局,3分及以上表示预后不良。

1.2.4 统计学处理 采用SPSS27.0软件。符合正态分布的计量资料以均数 \pm 标准差($\bar{x}\pm s$)表示,组间比较采用两样本 t 检验;不符合正态分布的计量资料采用中位数(四分位数间距)[$M(P_{25}, P_{75})$]表示,组间比较采用Mann-Whitney U检验。计数资料以例数、频数(n)或百分率(%)表示,组间比较利用 χ^2 检验或者Fisher确切概率法。应用二分类Logistic回归分析判断串联病变对前循环大血管闭塞性缺血性脑卒中血管内治疗预后的影响,计算优势比(Odds ratio, OR)和95%可信区间(Confidence

interval,CI)。以 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 串联病变患者临床资料和血管内治疗情况

本研究共入组 14 例串联病变患者,其中 11 例(78.57%)发病机制为动脉粥样硬化,3 例(21.43%)为血管夹层;10 例(71.43%)采用逆行开通的方法,11 例(78.57%)同期行颈动脉支架植入,3 例(21.43%)合并出血性转化,12 例(85.71%)实现完全血管再通,6 例(42.86%)预后良好(表 1)。

表 1 串联病变患者临床资料和血管内治疗情况

资料	串联病变组($n=14$)
年龄($\bar{x}\pm s$,岁)	67.57 \pm 16.44
男[$n(\%)$]	12(85.71)
高血压病[$n(\%)$]	9(64.29)
糖尿病[$n(\%)$]	3(21.43)
心房颤动[$n(\%)$]	2(14.29)
动脉粥样硬化[$n(\%)$]	11(78.57)
基线 NIHSS 评分($\bar{x}\pm s$,分)	20.64 \pm 7.65
静脉溶栓[$n(\%)$]	0(0.00)
穿刺至血管再通时间($\bar{x}\pm s$,min)	100.71 \pm 24.95
逆向开通[$n(\%)$]	10(71.43)
颈内动脉支架植入[$n(\%)$]	11(78.57)
成功血管再通[$n(\%)$]	12(85.71)
HT[$n(\%)$]	3(21.43)
治疗后第 90 d mRS 0~2 分[$n(\%)$]	6(42.86)

2.2 急性前循环大血管闭塞性缺血性脑卒中血管内治疗预后的单因素和多因素 Logistic 回归分析

串联病变($OR=1.119,95\%CI=0.182\sim 6.880,P=0.903$)对急性前循环大血管闭塞性缺血性脑卒中血管内治疗的预后无显著影响;基线 NIHSS 评分高($OR=1.230,95\%CI=1.099\sim 1.377,P<0.001$)、穿刺至血管再通时间长($OR=1.034,95\%CI=1.010\sim 1.059,P=0.006$)和出血性转化($OR=22.326,95\%CI=2.673\sim 186.474,P=0.004$)是影响急性前循环大血管闭塞性缺血性脑卒中血管内治疗预后的独立危险因素(表 2~3)。

3 讨论

目前关于 TL 的最佳血管内治疗策略是临床中的热点和难点问题,主要涉及病变血管的开通顺序、同期支架植入与否和术后抗栓药物应用。有研究表明,优先处理颅内病变血管可以缩短血流再灌注时间^[7],但有学者发现开通顺序对于最终的神经功能结局并无影响^[8]。对于 TL 颅外段颈内动脉处理方

表 2 急性前循环大血管闭塞性缺血性脑卒中血管内治疗预后的单因素分析

因素	预后良好组 ($n=42$)	预后不良组 ($n=48$)	t/χ^2	P
年龄($\bar{x}\pm s$,岁)	65.55 \pm 11.53	70.79 \pm 11.39	2.167	0.033
男[$n(\%)$]	30	23	5.115	0.024
高血压病[$n(\%)$]	23	31	0.900	0.343
糖尿病[$n(\%)$]	5	6	0.007	0.931
心房颤动[$n(\%)$]	17	25	1.213	0.271
静脉溶栓[$n(\%)$]	7	9	0.067	0.796
基线 NIHSS 评分($\bar{x}\pm s$,分)	16.50 \pm 6.01	23.27 \pm 5.58	5.537	<0.001
穿刺至血管再通时间 ($\bar{x}\pm s$,min)	67.26 \pm 25.38	88.88 \pm 33.98	3.378	0.001
HT[$n(\%)$]	2	18	13.890	<0.001
串联病变[$n(\%)$]	6	8	0.097	0.756

表 3 急性前循环大血管闭塞性缺血性脑卒中血管内治疗预后的多因素 Logistic 回归分析

因素	OR	95%CI	回归 系数	标准误	Wald	P
年龄	1.059	0.998~1.123	0.057	0.030	3.575	0.059
性别	0.461	0.126~1.687	0.775	0.662	1.370	0.242
基线 NIHSS 评分	1.230	1.099~1.377	0.207	0.058	12.924	<0.001
穿刺至血管再通时间	1.034	1.010~1.059	0.034	0.012	7.690	0.006
HT	22.326	2.673~186.474	3.106	1.083	8.225	0.004
串联病变	1.119	0.182~6.880	0.113	0.926	0.015	0.903

式,一期支架植入的优势在于有效改善脑组织血流,降低在等待择期处理颈动脉的过程中脑卒中再次发作机会,但存在的劣势可能导致支架内急性血栓形成后血管再次闭塞^[9]以及抗栓药物应用过程中引起的出血性转化^[10]。Wilson 等^[11]的荟萃分析表明急诊颈动脉支架植入与球囊扩张成形术疗效相当,但是另有一系列临床研究发现支架植入带来更高的血管再通率和更好的神经功能预后^[12-16],术后采取的抗栓措施并未增加出血风险^[17],因此急诊支架植入可能是最佳选择。基于上述理论基础和临床研究,本研究针对 TL 患者在个体化治疗的前提下主要优先开通颅内闭塞血管,同期行颈动脉支架植入术,术后无明显禁忌情况下均行抗血小板聚集治疗,预防颈内动脉再次闭塞,以期使患者获得更好的临床预后。

本研究结果显示,TL 占前循环大血管闭塞性缺血性脑卒中的 15.56%,与既往报道相似^[1-2]。本研究发现,TL 组以男性患者为主,且房颤比例较低,与既往研究相似^[18-19],这也能够解释 TL 本身的发病机制以动脉粥样硬化和夹层为主。

成功恢复缺血脑组织区域正常血流是提高脑梗死预后的重要因素之一,本研究 TL 血管内治疗后

再通率85.7%，既往类似的临床研究报道显示成功再灌注率为77%~87%^[2,20-21]，这种不同可能与前循环TL血管内治疗的入组标准、抗栓药物应用、手术方式以及取栓材料和技术的进步相关。

本研究TL出血性转化发生率为21.4%，与既往报道13%^[18]相比较高，本研究推测其原因如下：(1)本研究虽无静脉溶栓的患者，但采取急诊支架植入同时行持续抗栓治疗的比例高达84.6%；(2)本研究TL发病机制多为动脉粥样硬化狭窄基础上的急性闭塞，长期慢性缺血后突然血流恢复造成再灌注损伤，增加了出血风险^[22]；(3)本研究部分TL患者血管内治疗时优先处理颅外段颈内动脉，延迟了血管再通时间，加剧缺血损伤。

mRS评分是衡量脑卒中患者神经功能恢复情况的重要参数，直观反映预后良好与否。本研究以2分为分界点，经二分类Logistic回归分析显示基线NIHSS评分高、穿刺至血管再通时间长和出血性转化是影响急性前循环大血管闭塞性缺血性脑卒中血管内治疗预后的独立危险因素，与既往的临床研究结果相似^[23-25]。NIHSS评分反映患者的神经功能缺损程度，分值越高，症状越重，提示侧支循环代偿能力较差和梗死面积更大^[26]，因此发生不良预后的风险越大。缺血性脑卒中治疗的关键在于尽快开通闭塞血管，挽救缺血半暗带；穿刺至血管再通时间延迟会加剧脑组织坏死，而且提示血管内治疗的过程较为复杂，取栓次数增加，因此患者临床预后良好的可能性降低。出血性转化是血管内治疗术后的严重并发症之一，可引起血管痉挛、脑水肿加重、脑疝形成，造成患者症状进行性加重，预后不良。

虽然TL患者血管内治疗技术难度较高，术后管理更为严格，但本研究结果显示TL患者术后第90d预后良好率(mRS评分0~2分)42.9%，对前循环大血管闭塞性缺血性脑卒中血管内治疗的预后无显著影响，本研究推断可能与以下因素相关：(1)TL患者颈内动脉慢些狭窄或者夹层形成的过程中随着时间的推移建立部分侧支循环代偿血流；(2)缺血性脑卒中发作前颈动脉狭窄后的慢些低灌注可以诱发缺血预适应，使得脑组织再灌注后恢复能力较强^[27]；(3)有研究发现TL患者前交通动脉开放的机率高^[28]，因此侧支代偿可能更为丰富。

本研究存在一些不足：(1)本研究样本数相对较少，且为回顾性临床研究，不可避免的存在选择偏倚；(2)大血管闭塞患者采取的血管内治疗方式多为

临床医生根据自身经验自行决定，围手术期抗栓方案多个体化对待；(3)本研究采集的影像学指标较少，如阿尔塔卒中项目早期CT评分、侧支循环等。

综上所述，TL对急性前循环大血管闭塞性缺血性脑卒中血管内治疗的预后无显著影响，而基线NIHSS评分高、穿刺至血管再通时间长和出血性转化是导致其转归不良的独立危险因素。

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