·论著 临床诊治·

mTICI 2b级与3级再灌注对急性缺血性脑卒中患者远期预后的影响

周义锋[1)] 刘 燕[1)] 罗庆明[1)] 李 晶[2)]

1)安徽医科大学附属滁州医院(滁州市第一人民医院),安徽 滁州 239000 2)泰州市第四人民医院,江苏 泰州 225300

通信作者:周义锋

【摘要】 **目的** 探讨改良脑梗死溶栓(mTICI)评分2b级与mTICI 3级再灌注对急性缺血性脑卒中(AIS)患者远期预后的影响。**方法** 纳入2019-06—2021-06安徽医科大学附属滁州医院收治的AIS患者80例,根据血管内治疗(EVT)后mTICI再灌注程度分为A组和B组,A组为30例mTICI 2b级再灌注AIS患者,B组为50例mTICI 3级再灌注AIS患者。比较2组患者治疗后1 d梗死灶体积变化、责任血管再闭塞率、出血转化率、美国国立卫生研究院卒中量表(NIHSS)评分、病死率及症状性颅内出血(sICH)发生率,采用改良Rankin量表(mRS)评估2组患者预后情况。**结果** 治疗后6个月,2组患者术后梗死灶体积、责任血管再闭塞率、出血转化率、sICH、病死率及预后良好率比较,均无统计学差异(P>0.05);治疗后1周、3个月及6个月,2组患者NIHSS评分较之前均降低,且同时间段B组NIHSS评分均低于A组(P<0.05)。**结论** mTICI 2b级与mTICI 3级再灌注AIS患者均能取得较好疗效及预后,但mTICI 3级再灌注AIS患者的神经功能恢复更好,预后结局更佳。

【关键词】 血管内治疗;急性缺血性脑卒中;再灌注;预后;改良脑梗死溶栓评分

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Effect of mTICI grade 2b and 3 reperfusion on the long-term prognosis of patients with acute ischemic stroke

ZHOU Yifeng[1)], LIU Yan[1)], LUO Qingming[1)], LI Jing[2)]

1) Chuzhou Hospital Affiliated to Anhui Medical University/Chuzhou First People's Hospital, Chuzhou 239000, China;

2) Taizhou Fourth People's Hospital, Taizhou 225300 China

Corresponding author: ZHOU Yifeng

【**Abstract**】 **Objective** To investigate the effect of modified thrombolysis in cerebral infarction (mTICI) grade 2b and mTICI grade 3 reperfusion on the efficacy and long-term prognosis of patients with acute ischemic stroke (AIS). **Methods** A total of 80 AIS patients admitted to Chuzhou Hospital Affiliated to Anhui Medical University from June 2019 to June 2021 were selected and divided into group A and group B according to the degree of mTICI reperfusion after endovascular therapy (EVT). Group A consisted of 30 patients with mTICI grade 2b reperfusion AIS, and group B consisted of 50 patients with mTICI grade 3 reperfusion AIS. The changes in infarct volume, responsible vessel reocclusion rate, hemorrhagic transformation rate, National Institutes of Health stroke scale (NIHSS) score, fatality rate and incidence of symptomatic intracranial hemorrhage (sICH) were compared between the two groups at 1 day after treatment. The Rankin scale (mRS) was used to evaluate the prognosis of the two groups of patients. **Results** Six months after treatment, there were no significant differences

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in postoperative infarct volume, responsible vessel reocclusion rate, hemorrhagic transformation rate, sICH, fatality rate and good prognosis rate between the two groups (P>0.05). At 1 week, 3 months and 6 months after treatment, the NIHSS scores of both groups were lower than before, and the NIHSS scores of group B were lower than those of group A at the same time period (P<0.05). **Conclusion** AIS patients with TICI grade 2b and TICI grade 3 reperfusion can achieve better curative effect and prognosis, but mTICI grade 3 reperfusion AIS patients have better neurological function recovery, which is more conducive to the prognosis of patients.

【Key words】 Endovascular therapy; Acute ischemic stroke; Reperfusion; Prognosis; Modified thrombolysis in cerebral infarction score

急性缺血性脑卒中(acute ischemic stroke, AIS)是卒中主要亚型之一,主要是由脑血管血栓形成导致的脑缺血,是全球人类死亡和长期残疾主要原因之一[1]。目前临床主要采用重组组织型纤溶酶原激活剂(recombinant tissue plasminogen, rt-PA)静脉溶栓治疗AIS,但由于其适应证、禁忌证、治疗时间窗相对严格,较少患者接受溶栓治疗,且患者静脉溶栓后血管再通率较低,故血管内治疗(endovascular treatment, EVT)逐渐成为治疗AIS前循环大血管闭塞患者常用手段[2]。AIS治疗指南推荐,发病6 h内疑似AIS患者,在不影响静脉溶栓的情况下,可先做无创脑血管成像,出现异常后立即做血管造影,必要时行EVT[3-4]。成功再灌注是AIS患者EVT后良好功能结果的预测指标[5]。目前美国心脏协会指南建议将改良脑梗死溶栓(modified thrombolysis in cerebral infarction, mTICI)评分2b或更高作为前循环AIS患者EVT的血管造影目标。最新欧洲卒中组织-欧洲微创神经治疗学会指南也显示,当AIS患者获得mTICI 2b级或mTICI 3级再灌注时,被认为血管开通成功[6]。但有报道[7]显示,mTICI 3级再灌注患者经EVT后功能恢复更好。基于此,本研究对mTICI 2b级与mTICI 3级再灌注AIS患者的疗效进行比较,并分析其对AIS患者远期预后的影响,以期为临床AIS患者EVT提供更多参考依据。

1 资料与方法

1.1 一般资料 纳入2019-06—2021-06安徽医科大学附属滁州医院收治的AIS患者80例,根据EVT后mTICI再灌注程度分为A组和B组。A组为30例mTICI 2b级AIS患者,B组为50例mTICI 3级AIS患者。2组基线资料比较无统计学差异(P>0.05),具有可比性。见表1。

1.2 纳入及排除标准 纳入标准:(1)符合AIS诊断标准[8];(2)经EVT后血管再灌注达mTICI 2b级或mTICI 3级;(3)大脑中动脉M1或M2段、颈内动脉颅内段造影明确为前循环大血管闭塞;(4)发病时间≤6 h;(5)既往无明显功能障碍;(6)年龄18~85岁;(7)NIHSS评分≥8分。

排除标准:(1)有治疗禁忌证者;(2)合并癌症者;(3)MRI或CT显示缺血半暗带体积<15 mL或不匹配率<1.8,术前脑梗死范围>1/3大脑中动脉供血区域;(4)伴严重心、肝、肾功能不全者;(5)存在后循环梗死;(6)伴高出血风险疾病者;(7)临床资料不全者。

1.3 方法 术前处理:若患者存在静脉溶栓适应证,首先进行静脉溶栓治疗:使用rt-PA(勃林格英格翰国际公司,德国)按照0.9 mg/kg标准给药,1 min内静脉推注1/10的rt-PA,余下9/10的rt-PA持续静脉推注1 h,注意总剂量≤90 mg。患者均行多模式MRI检查评估梗死病灶、缺血半暗带及初步明确责任血管。

EVT:局部麻醉,常规Seldinger法穿刺右股动脉,由导管引导6F或8F动脉鞘置入,血管闭塞段远端置入微血管,确认造影及远端血管情况。将微导丝抽出,闭塞段由微导管置入Solitaire AB支架,静止5 min,使支架与血栓紧密结合。缓慢抽出微导管及支架,负压抽吸预防栓子逃逸。取栓后立即复查造影,手术成功为血管开通至mTICI 2b级或mTICI 3级。术中可根据患者情况多次取栓,建议取栓次数不超过4次。血管再通后观察30 min,评估责任血管再闭塞风险,以制定后续治疗方案。

mTICI分级:无灌注为0级;仅有微量血流通过闭塞段,极少或无灌注为1级;前向血流部分灌注小于下游缺血区1/2为2a级;前向血流部分灌注大于下游缺血区1/2为2b级;下游缺血区被前向血流完全灌注为3级。

术后处理:患者术后需即刻复查头颅CT,并转至卒中单元病房。若CT显示少量高密度影,怀疑为造影剂渗漏或少量出血,需根据患者病情调整抗栓治疗,每4 h进行一次头颅CT复查。若CT未出现高密度影,24 h后头颅CT复查,分析病灶情况。若CT出现出血转化明显,根据病情推迟抗栓治疗,CT动态复查,出血量较多者可行去骨瓣减压术。此过程中若有神经功能恶化,立即头颅CT复查。患者均于术后24 h行常规多模式MRI或CT复查血管造影明确责任

表1 2组基线资料比较

Table 1 Comparison of baseline data between the two groups

基线资料	A组(n=30)	B组(n=50)	χ^2/t值	P值
性别[n(%)]				
男	19(63.33)	33(66.00)	0.059	0.809
女	11(36.67)	17(34.00)		
年龄/(岁,$\bar{x}\pm s$)	67.43±11.06	66.72±10.78	0.282	0.778
BMI/(kg/m^2,$\bar{x}\pm s$)	25.52±2.30	25.79±2.44	0.489	0.626
饮酒史[n(%)]	8(26.67)	21(42.00)	1.908	0.167
吸烟史[n(%)]	9(30.00)	19(38.00)	0.527	0.468
高血压[n(%)]	19(63.33)	33(66.00)	0.059	0.809
糖尿病[n(%)]	9(30.00)	14(28.00)	0.037	0.848
冠心病[n(%)]	8(26.67)	11(22.00)	0.225	0.635
房颤[n(%)]	12(40.00)	21(42.00)	0.031	0.860
脑梗死[n(%)]	6(20.00)	9(18.00)	0.049	0.824
术前NIHSS评分/(分,$\bar{x}\pm s$)	15.47±6.44	15.24±5.79	0.165	0.869
静脉溶栓[n(%)]	21(70.00)	28(56.00)	1.548	0.213
发病至再灌注时间/(min,$\bar{x}\pm s$)	318.83±78.95	292.02±81.62	1.440	0.154
发病至溶栓时间/(min,$\bar{x}\pm s$)	142.93±57.64	122.44±46.68	1.739	0.086
取栓方式[n(%)]				
抽吸	1(3.33)	6(12.00)	7.756	0.101
支架	23(76.67)	28(56.00)		
抽吸+支架	4(13.33)	3(6.00)		
其他	2(6.67)	13(26.00)		
取栓次数/(次,$\bar{x}\pm s$)	2.13±0.50	1.78±0.46	1.266	0.209

注:BMI:体重指数;NIHSS:美国国立卫生研究院卒中量表

血管再通情况。

1.4 观察指标 (1)临床指标:比较2组治疗后1 d出血转化率、责任血管再闭塞率及梗死灶体积变化。出血转化:脑梗死后首次头颅CT/MRI无颅内出血,而复查有出血,或根据首次头颅CT/MRI可确认出血性梗死。血管再闭塞:血管治疗后再通血管在其原闭塞部位或远端出现再次闭塞。梗死体积=最大长径×宽径×阳性层面数×层厚×π/6。(2)神经功能:分别于治疗前及治疗后1 d、1周及6个月评估2组NIHSS评分。NIHSS评分评估神经功能缺损程度:0~15分为轻度,16~30分为中度,31~42分为重度,满分42分,分值越高,神经功能缺损越严重[9]。(3)病死率:记录2组治疗后6个月死亡情况。(4)症状性颅内出血(symptomatic intracranial hemorrhage,sICH)发生率:记录2组治疗后6个月sICH发生情况,sICH为48 h内NIHSS评分升高>4分或导致死亡的颅内出血。(5)预后指标:于治疗后6个月采用改良Rankin量表(modified Rankin scale,mRS)[10]评估2组预后情况,0分表示无症状,6分表示死亡,0~2分表示预后良好,3~6分表示预后不良。

1.5 统计学分析 应用SPSS 26.0软件分析数据,以均数±标准差($\bar{x}\pm s$)表示近似正态分布的计量资料,行t检验,不同时段间NIHSS评分比较行重复测量资料方差分析;计数资料以率(%)表示,行χ^2检验,$P<0.05$为差异有统计学意义。

2 结果

2.1 2组临床指标比较 2组术后梗死灶体积、责任血管再闭塞率、出血转化率比较,均无统计学差异($P>0.05$)。见表2。

表2 2组临床指标比较

Table 2 Comparison of clinical indicators between the two groups

组别	n	术后梗死灶体积/($\bar{x}\pm s$,mL)	责任血管再闭塞率[n(%)]	出血转化率[n(%)]
A组	30	12.23±4.36	6(20.00)	9(30.00)
B组	50	11.38±4.49	6(12.00)	19(38.00)
χ^2/t值		0.829	0.941	0.527
P值		0.410	0.332	0.468

2.2 2组病死率及sICH发生率比较 治疗后6个月，2组患者sICH及病死率比较均无统计学差异（$P>0.05$）。见表3。

表3 2组患者病死率及sICH发生率比较 ［n(%)］

Table 3 Comparison of mortality and sICH incidence between the two groups ［n(%)］

组别	n	死亡	sICH
A组	30	2(6.67)	2(6.67)
B组	50	9(18.00)	2(4.00)
χ^2值		2.031	0.281
P值		0.154	0.596

2.3 2组存活患者NIHSS评分比较 治疗后1 d，2组存活患者NIHSS评分比较均无统计学差异（$P>0.05$）；治疗后1周、3个月及6个月，2组存活患者NIHSS评分均较之前降低，且同时间段B组NIHSS评分均低于A组（$P<0.05$）。见表4。

2.4 2组预后指标比较 治疗后6个月，A组mRS评分≤2分者19例，预后良好率67.86%；B组mRS评分≤2分者35例，预后良好率85.37%。2组预后良好率比较均无统计学差异（$\chi^2=2.998$，$P=0.083$）。

表4 2组存活患者NIHSS评分比较 （分，$\bar{x}\pm s$）

Table 4 Comparison of NIHSS scores between the two groups of surviving patients （scores，$\bar{x}\pm s$）

组别	n	治疗后1 d	治疗后1周	治疗后3个月	治疗后6个月
A组	28	15.11±3.39	10.36±3.57[a]	7.07±2.49[ab]	3.64±1.11[abc]
B组	41	14.32±2.52	8.32±2.22[a]	4.32±1.33[ab]	2.17±0.90[abc]
t值		1.110	2.928	5.950	6.057
P值		0.271	0.005	<0.001	<0.001

注：与同组内治疗前比较，[a]$P<0.05$；与同组内治疗后1周比较，[b]$P<0.05$；与同组内治疗后3个月比较，[c]$P<0.05$

3 讨论

AIS患者中颅内大血管闭塞而导致的AIS最严重，数分钟内将发生责任血管供血部位脑组织由核心向周围快速延伸的缺血性坏死，而周边部分脑组织通过侧支循环得到一定代偿后形成缺血半暗带，可逆性恢复其内的大量神经元功能，因此，大血管闭塞性AIS患者的治疗重点是尽快使闭塞血管再通获得再灌注，最大限度维持缺血半暗带内脑细胞生存，改善神经功能。多项研究[11-15]已表明，早期时间窗内EVT效果优于单纯静脉溶栓。但尽管采取EVT治疗取得较高再通率，但预后良好患者仅有33%~71%，仍有一部分患者预后不良[16-18]。

反复取栓可能会引起血管内膜损伤，导致血栓形成及出血转化，影响患者预后[19-21]。此外，有研究[14,22-23]表明，更大程度再灌注能减少梗死体积增加。本研究显示，2组术后梗死灶体积、责任血管再闭塞率、出血转化率相比差异均无统计学意义，这可能是纳入样本量较小的原因。但本研究中mTICI 3级再灌注AIS患者梗死灶体积有低于mTICI 2b级患者的趋势，分析原因为更好再灌注能改善少数闭塞分支血流，从而促进静脉rt-PA功能，增加血栓清除及自发再灌注能力，进而减小梗死灶体积。但临床实践发现，EVT中栓子破裂或逃逸易引起患者术后远端分支闭塞[24-26]，故再灌注程度可能是AIS患者预后的预测因素。

死亡及sICH均为血管成功再灌注患者重要不良事件，因此，对此类事件评估至关重要[15,27-30]。血管再通会增加血管壁损伤和远端栓塞的发生，破坏微循环灌注，而较高血管再灌注能减少患者术中血管再通次数，对血管损伤较少，有望降低sICH发生率[16,31-42]。本研究显示，2组sICH发生率及病死率比较差异无统计学意义，分析可能是病例较少的原因。研究表明，良好的血管再灌注状态是AIS患者良好功能结果的独立预测因素[17,43-48]。本研究显示，治疗后1 d2组间NIHSS评分比较差异无统计学意义，而治疗后1周、3个月及6个月2组NIHSS评分均较之前降低，且同时间段B组NIHSS评分较A组更低，表明mTICI 2b级和mTICI 3级再灌注均能降低AIS患者神经功能损伤的发生率，改善预后，但mTICI 3级更有利于改善患者预后，分析原因为mTICI 2b级再灌注患者经EVT治疗后仍有远端闭塞残留及相关灌注缺损，减少神经功能获益，神经功能恢复较慢，治疗效果较差。

EVT再灌注的影响因素较多，有研究[18]报道，栓子数量、质地及血管解剖学异常是引起患者获取再灌注时间较长或未达到完全再灌注的主要因素。本研究中，mTICI 3级再灌注患者侧支血流循环较mTICI 2b级再灌注患者更好。最近一项研究[19]表明，治疗前侧支循环良好可能会提高接受机械血运重建治疗的卒中患者的再通和再灌注率。然而，良好侧支循环对成功血运重建的影响机制仍知之甚

少，可能与侧支循环能促进血栓清除的机械效应有关。mTICI 2b级再灌注患者可能伴组织水肿、微血管系统损伤及微血管血栓，造成局部血流降低，这在冠状动脉介入术中视为预后不良的重要预测因素[20]。本研究通过6个月mRS评分评估患者预后情况发现，2组预后良好率比较差异无统计学意义，但41例mTICI 3级再灌注AIS患者有35例(85.37%)预后良好，而28例mTICI 2b级再灌注AIS患者中有19例(67.86%)预后良好，表明mTICI 3级再灌注更有利于预后，可能是mTICI 3级再灌注患者梗死体积较小、神经功能恢复更好的原因。

mTICI 2b级与mTICI 3级再灌注的AIS患者均能取得较好疗效及预后结局，但mTICI 3级AIS患者的神经功能恢复更好，更有利于患者预后。本研究的局限性：本研究为单中心研究，评估不够全面，需进一步扩大分析范围；纳入样本量较小，未来应扩大样本量，并结合多个研究中心数据进行分析，以提供更有力的理论依据。

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