

动脉瘤破裂出血行血管内介入栓塞术后并发脑梗死 临床分析

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【摘要】目的 探讨前交通动脉瘤破裂伴蛛网膜下腔出血行血管内介入栓塞术后并发脑梗死的独立危险因素。**方法** 回顾性分析 2016-01—2020-04 于梅州市人民医院确诊的前交通动脉瘤破裂伴蛛网膜下腔出血患者 180 例, 将其中 37 例行血管内介入栓塞术后再梗死纳入脑梗死组, 143 例行血管内介入栓塞术后无脑梗死情况发生纳入非脑梗死组, 以单因素分析对血管内介入栓塞术后并发脑梗死的影响因子进行筛选后, 采用多因素 Logistic 分析寻求其独立危险因素。**结果** 单因素分析显示, 神经功能障碍、脑积水、血肿、动脉瘤大小、宽颈动脉瘤、卒中史、高血压史、糖尿病史为血管内介入栓塞术后并发脑梗死的影响因子 ($P < 0.05$); 多因素 Logistic 回归分析显示, 血肿 ($OR = 2.421, P = 0.010$)、脑积水 ($OR = 3.561, P = 0.027$) 为血管内介入栓塞术后再梗死的独立危险因素。**结论** 前交通动脉瘤破裂伴蛛网膜下腔出血行血管内介入栓塞术后并发脑梗死的影响因素较多, 临床应针对血肿、脑积水等常见危险因素进行预防和干预, 可降低介入栓塞术后脑梗死的发生风险。

【关键词】 前交通动脉瘤; 蛛网膜下腔出血; 脑梗死; 血管内介入栓塞术; 危险因素

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Clinical analysis of cerebral infarction after intravascular interventional embolization for aneurysm rupture with hemorrhage

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【Abstract】Objective To investigate the independent risk factors of cerebral infarction after intravascular interventional embolization for anterior communicating aneurysm rupture with subarachnoid hemorrhage. **Methods** Totally 180 patients with anterior communicating aneurysm rupture complicated with subarachnoid hemorrhage diagnosed in Meizhou People's Hospital were retrospectively analyzed between January 2016 and April 2020. Among them, 37 cases with re-infarction after intravascular interventional embolization were included in the cerebral infarction group, and 143 cases without cerebral infarction were enrolled as the non-cerebral infarction group. After screening the influencing factors of cerebral infarction after intravascular interventional embolization by univariate analysis, the independent risk factors were found by multivariate Logistic analysis. **Results** Univariate analysis showed that neurological dysfunction, hydrocephalus, hematoma, aneurysm size, wide necked aneurysm, stroke history, hypertension history and diabetes history were the influencing factors of cerebral infarction after intravascular interventional embolization ($P < 0.05$). Multivariate Logistic regression analysis showed that hematoma ($OR = 2.421, P = 0.010$) and hydrocephalus ($OR = 3.561, P = 0.027$) were independent risk factors for re-infarction after intravascular interventional embolization. **Conclusion** There are many influencing factors of cerebral infarction after intravascular interventional embolization for anterior communicating artery

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aneurysm rupture with subarachnoid hemorrhage. It is necessary to carry out prevention and intervention for common risk factors such as hematoma and hydrocephalus in clinical practice so as to reduce the risk of cerebral infarction after interventional embolization.

【Key words】 Anterior communicating aneurysm rupture; Subarachnoid hemorrhage; Cerebral infarction; Intravascular interventional embolization; Risk factors

颅内动脉瘤是颅内动脉血管壁的局限病理性扩张,相关文献报道,其破裂率为 3.6%~6.0%^[1],颅内动脉瘤破裂是造成自发性蛛网膜下腔出血(subarachnoid hemorrhage, SAH)的首位病因。动脉瘤性蛛网膜下腔出血(aneurysmal subarachnoid hemorrhage, aSAH)是一种复杂的脑血管疾病,全球发病率约为 700 000 人/年,预后结局差,总病死率约为 40%,是严重危害人类健康的脑血管疾病^[1-2]。前交通动脉(anterior communicating artery, ACoA)动脉瘤占有所有动脉瘤的 25%~35%,是最常见的动脉瘤破裂部位,约 40%的 SAH 发生于 ACoA 动脉瘤破裂。由于 ACoA 复合体血管变异众多,周围存在重要结构,关系复杂,对手术要求高,是临床最难处理的颅内动脉瘤之一^[3]。近年来,随着开颅夹闭和介入栓塞手术治疗在临床中广泛应用,较大程度改善了患者的预后水平,降低了病死率^[4]。临床研究显示,血管内介入栓塞术相对于传统开颅夹闭术具有微创、恢复快、显著降低患者术后致残率和病死率等优势^[5],但动脉瘤破裂后广泛的 SAH 造成的一系列脑损伤及其导致的各种并发症仍是造成预后不良的重要原因。由于 ACoA 复合体周围毗邻众多重要结构,动脉瘤破裂出血后有可能导致更多的并发症。研究显示,前交通动脉瘤破裂伴蛛网膜下腔出血导致的并发症具有极高的致死与致残率^[6-7]。其中脑梗死为其并发症之一,可发生于动脉瘤破裂出血早期,亦可因 aSAH 病情进展所致脑血管痉挛引发脑梗死^[8-9]。脑梗死不仅与前交通动脉瘤破裂伴蛛网膜下腔出血患者病情严重程度存在显著的相关性,亦对预后具有重要影响^[10]。目前对前交通动脉瘤破裂出血行介入栓塞术后并发脑梗死的研究较少,因此,本文通过剔除混杂因素后,对前交通动脉瘤破裂伴蛛网膜下腔出血并发脑梗死患者进行多因素逻辑回归分析,以及早识别危险因素,为疾病预后判断提供参考及临床早期干预提供依据,以改善患者预后。

1 对象与方法

1.1 研究对象 回顾性分析 2016-01—2020-04 于梅州市人民医院确诊的前交通动脉瘤破裂伴蛛网膜下腔出血患者 180 例,将其中 37 例行血管内介入栓

塞术后再梗死纳入脑梗死组,143 例行血管内介入栓塞术后无脑梗死情况发生纳入非脑梗死组,2 组临床基线资料比较差异无统计学意义($P > 0.05$)。

纳入标准:(1)经影像学检查确认为前交通动脉瘤破裂伴蛛网膜下腔出血,并满足血管内介入栓塞术指征;(2)所有患者均经主治医师依据其年龄、全身情况、动脉瘤形态及位置、发病后状态以及自身与家属意愿最终确定行血管内介入栓塞者;(3)动脉瘤直径 ≤ 15 mm,既往动脉瘤破裂 < 3 次;(4)确定知情同意书者。**排除标准:**(1)颅内动脉畸形、血管畸形;(2)动脉瘤为外伤原因导致;(3)自身造血或免疫功能不全者。本研究在本院医学伦理委员会的审核通过情况下实施。

1.2 方法 血管内介入栓塞术:术前行常规抗血小板治疗,嘱患者保持仰卧位,气管插管位置确认后行全身麻醉,待麻醉生效以改良 Seldinger 法行右侧股动脉穿刺,插入 6F 动脉鞘后经由导丝引导导管进行双侧颈内动脉及椎动脉血管造影,初步确定动脉瘤形态、大小、位置及瘤体、瘤颈之间的大小关系。待动脉瘤各参数确认完毕后依据其造影图像结果选择大小合适的微弹簧圈,并将其末端置于动脉瘤颈部 1/3 处,防止动脉瘤壁破损,视患者情况进行调整,确保弹簧圈致密无腔隙,并再次造影确认栓塞效果是否满意。窄颈动脉瘤患者给予单纯栓塞,宽颈动脉瘤患者给予支架辅助栓塞(依据先前造影结果选择大小合适的支架)。对松开弹簧后的动脉瘤体实施血管造影,观察栓塞效果,若效果良好则水解弹簧,拔出导管,留置导管鞘 2 h 后按压捆绑 24 h 以上。待血管内介入栓塞术完成后,给予常规血管扩张药物防止术后血管痉挛,同步辅助降颅压及神经营养支持。

1.3 观察指标 收集患者完整的病历资料,用于基线分析。采用格拉斯哥昏迷评分对患者意识恢复程度进行评估,主要观察患者睁眼、语言及运动方面,最高分 15 分,昏迷越重者的昏迷指数得分越低。采用 Hunt-Hess 评分对蛛网膜下腔出血情况进行评估,将患者仅存在轻度头痛、颈强直或无症状视为 I 级;将患者头痛程度为中、重度,仅有神经麻痹症状视为 II 级;将患者意识模糊,存在轻度灶性神经功能缺

失视为Ⅲ级;将患者存在中、重度麻痹或木僵视为Ⅳ级;将患者进入深度昏迷,面临濒死状态视为Ⅴ级。收集发病到就诊时间、神经功能是否出现障碍、脑积水情况、是否合并血肿、动脉瘤直径、是否为宽颈动脉瘤、既往是否存在卒中史、高血压史、糖尿病史、是否为多发动脉瘤、入院血压、入院血糖、入院血脂、同型半胱氨酸、肝功能异常(谷丙转氨酶>135)、肾功能异常(肌酐>265 μmol/L)等指标。

1.4 统计学处理 采用SPSS 26.0软件进行统计学处理。计量数据以均数±标准差($\bar{x}\pm s$)表示,行t检验;计数数据以百分率(%)表示,组间比较采用卡方检验与Fisher确切概率法。首先通过单因素分析对术后并发脑梗死的危险因子进行筛选,然后采用多因素Logistic分析寻求独立危险因素,以 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 2组患者基线资料比较 通过对比脑梗死组与非脑梗死组临床基线资料,2组患者年龄、性别、体重指数(BMI)、肝功能异常、肾功能异常、发病到就诊时间、GCS评分、Hunt-Hess分级、CT-Fisher分级、同型半胱氨酸水平比较差异均无统计学意义($P>0.05$)。见表1。

表1 2组患者基线资料比较

Table 1 Comparison of baseline data of two groups

基线资料	脑梗死组 (n=37)	非脑梗死组 (n=143)	χ^2/t 值	P值
年龄/(岁, $\bar{x}\pm s$)	53.76±19.38	58.37±10.57	1.945	0.053
BMI/(kg/m ² , $\bar{x}\pm s$)	23.62±2.19	24.08±2.73	0.948	0.344
性别				
男	21	64	1.699	0.192
女	16	79		
发病到就诊时间/ (h, $\bar{x}\pm s$)	38.30±7.52	36.57±7.32	1.274	0.204
GCS评分/(分, $\bar{x}\pm s$)	13.44±3.19	13.48±2.66	0.078	0.939
Hunt-Hess分级			0.372	0.542
I ~ II	21	89		
III ~ V	16	54		
CT-Fisher分级			0.019	0.890
I ~ II	24	91		
III ~ IV	13	66		

2.2 血管内介入栓塞术后再梗死的单因素分析 对前交通动脉瘤破裂伴蛛网膜下腔出血血管内介入栓塞术后再梗死的影响因素进行分析,结果显示,神经功能障碍、血肿、CTA动脉瘤大小、DSA动脉瘤大

小、宽颈动脉瘤、卒中史、高血压史、糖尿病史为血管内介入栓塞术后并发脑梗死的影响因子($P<0.05$)。见表2、图1~2。

表2 血管内介入栓塞术后再梗死的单因素分析

Table 2 Univariate analysis of re-infarction after intravascular interventional embolization

项目	脑梗死组 (n=37)	非脑梗死组 (n=143)	χ^2/t 值	P值
侧脑室外引流			1.274	0.259
是	15	44		
否	22	99		
神经功能障碍			18.530	<0.001
有	21	30		
无	16	113		
脑积水			3.234	0.072
有	25	73		
无	12	70		
血肿			33.684	<0.001
有	14	6		
无	23	137		
CTA动脉瘤大小			13.592	<0.001
≥5 mm	22	39		
<5 mm	15	104		
DSA动脉瘤大小			13.701	<0.001
≥5 mm	23	42		
<5 mm	14	101		
宽颈动脉瘤			15.166	<0.001
是	17	23		
否	20	120		
多发动脉瘤			0.471	0.483
是	8	24		
否	29	119		
卒中史			12.057	<0.001
有	9	8		
无	28	135		
高血压史			3.976	0.046
有	19	48		
无	18	95		
糖尿病史			6.041	0.014
有	8	11		
无	29	132		

2.3 血管内介入栓塞术后再梗死的多因素分析 通过单因素分析对前交通动脉瘤破裂伴蛛网膜下腔出血血管内介入栓塞术后并发脑梗死影响因素的筛选,以术后再发梗死(有=1,无=0)作为因变量,血肿(有=1,无=0)和脑积水(有=1,无=0)作为自变量,分析影响术后再梗死的危险因素,多因素Logistic回归

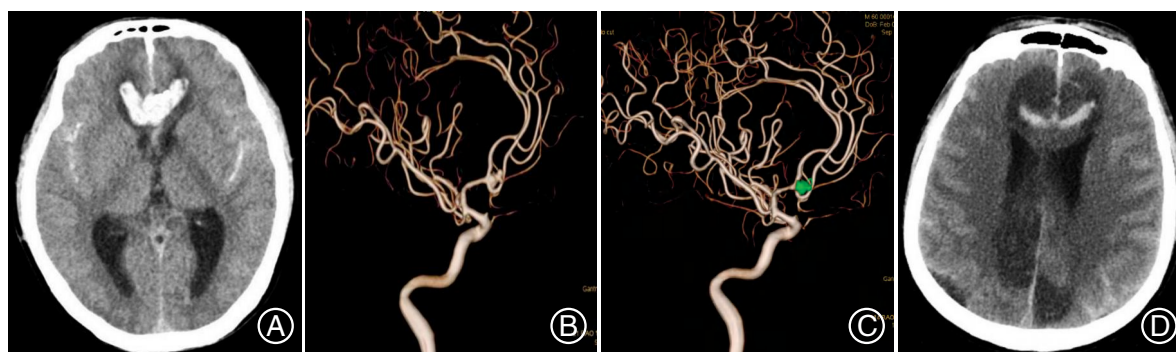


图 1 A:前交通动脉瘤破裂出血合并额叶血肿;B:DSA 提示前交通规则动脉瘤;C:动脉瘤介入栓塞术后动脉瘤闭塞;D:术后 1 周复查 CT 提示并发双额叶脑梗死

Figure 1 A: Anterior communicating aneurysm rupture and hemorrhage with frontal lobe hematoma; B: Regular anterior communicating aneurysm shown by DSA; C: Aneurysm occlusion after aneurysm interventional embolization; D: Bifrontal cerebral infarction shown by follow-up CT at 1 week after surgery



图 2 A:前交通动脉瘤破裂出血合并脑积水;B:DSA 提示前交通规则动脉瘤;C:动脉瘤介入栓塞术后动脉瘤闭塞;D:术后 1 周复查 MR 提示并发额叶脑梗死

Figure 2 A: Anterior communicating artery aneurysm rupture and hemorrhage with hydrocephalus; B: Regular anterior communicating aneurysm shown by DSA; C: Aneurysm occlusion after aneurysm interventional embolization; D: Frontal cerebral infarction shown by follow-up MR at 1 week after surgery

分析显示,血肿($OR=2.421, P=0.010$)、脑积水($OR=3.561, P=0.027$)为血管内介入栓塞术后再梗死的独立危险因素。见表 3。

表 3 血管内介入栓塞术后再梗死的多因素分析
Table 3 Multivariate analysis of re-infarction after intravascular interventional embolization

变量	B	S.E.	Wald χ^2	OR	95% CI		P 值
					上限	下限	
血肿	0.884	0.341	6.720	2.421	1.241	4.723	0.010
脑积水	1.270	0.573	4.912	3.561	1.158	10.947	0.027

3 讨论

前交通动脉瘤是颅内动脉瘤多发部位,发生率约为 30%^[11]。绝大多数情况下,前交通动脉瘤破裂会导致蛛网膜下腔出血,这与实质内血肿或脑室出血高度相关。鉴于前交通动脉在人体解剖学位置中较为特殊,易出现较多变异情况,加之前交通动脉部位肿瘤生长可能存在较多可能,导致周围邻近组织

结构构成较其他脑神经肿瘤更为复杂,因此,对血管内介入栓塞术治疗前交通动脉瘤破裂伴蛛网膜下腔出血有较高的技术要求,并且有一定风险的并发症发生概率^[12-13]。前交通动脉瘤破裂伴蛛网膜下腔出血患者术后并发脑梗死是一种严重的并发症^[14-15],具有较高的致死率与致残率,因此,对其独立危险因素的分析尤为重要^[16]。

本研究通过剔除脑梗死组与非脑梗死组混杂因素的影响,通过单因素分析筛选出神经功能障碍、脑积水、血肿、动脉瘤大小、宽颈动脉瘤、卒中史、高血压史、糖尿病史为血管内介入栓塞术后并发脑梗死的影响因子。神经功能障碍在血管内介入栓塞术后主要表现为血管性功能障碍,主要是颅内动脉血管痉挛和微血管功能障碍,血管因弹性减弱及痉挛导致的血压波动异常引起供血不足^[17],最终可能引发脑梗死,因此,神经功能障碍为血管内介入栓塞术后并发脑梗死的影响因素之一。前交通动脉动脉瘤破

裂后容易并发急性脑积水,导致早期颅内压增高以及脑损伤,严重影响病人预后。急性脑积水患者颅内出血后凝血引起脑脊液循环通路狭窄或梗阻,导致蛛网膜颗粒机械性堵塞以及纤维化的发生,进而造成脑脊液的吸收和分泌发生异常变化,此外,血细胞中代谢分解产物以及基质金属蛋白酶因子失衡还会造成血-脑屏障的进一步破坏^[18-19],使得患者术后更易发生脑梗死。动脉瘤大小与出血量、介入手术的难度及术后并发症存在相关性,因此其为血管内介入栓塞术后并发脑梗死的影响因子。既往研究表明,动脉瘤直径越大,瘤体内部更易形成湍流,且通常均为宽颈动脉瘤,多需要辅助支架进行栓塞,与单纯采用弹簧圈栓塞的方案相比,颅内微缺血发生率明显增加,辅助支架不仅易造成血管内皮损伤和内皮下胶原纤维暴露,还可导致内源性凝血系统异常激活,进而形成微小栓子,使血栓形成风险显著增加^[20]。先天性动脉血管壁发育不良是颅内动脉瘤发病的主要因素之一,组织学检查过程中发现,颅内动脉瘤患者动脉壁仅有一层内膜,难以观察到中层平滑肌的存在,且弹性纤维基本断裂及消失,患者毛细血管壁异常薄弱,极易破裂引发微血栓的形成^[21],因此,其对血管内介入栓塞术后并发脑梗死可能存在一定的正向推动作用机制。有卒中史的患者术后更易并发脑梗死的原因考虑为既往发生过脑卒中的患者血管内皮存在陈旧性损伤^[22],颅内可能存在已形成的微栓子,对脑部正常血流灌注产生影响,导致血流动力学发生改变,使术中动脉瘤破裂的可能性增加,进而影响预后^[23]。高血压、糖尿病为脑梗死的高危因素,高血压、高血糖与动脉粥样硬化及缺氧环境存在直接的关系,此外,长期高血压、高血糖还会造成颅内血管内皮损伤,诱导血管平滑肌增殖,影响原有凝血、纤溶的动态平衡,诱导血栓形成,引起血管狭窄与闭塞^[24],使血流灌注发生改变,加重靶器官损伤和脑组织损害,最终引发术后脑梗死。

本研究通过单因素分析对前交通动脉瘤破裂伴蛛网膜下腔出血行血管内介入栓塞术后并发脑梗死的影响因素筛选后,进行多因素 Logistic 回归分析得出,水肿、脑积水为血管内介入栓塞术后再梗死的独立危险因素,表明有急性脑积水的患者血管内介入栓塞术后发生脑梗死的风险为无脑积水的 2.653 倍,其中并发水肿患者血管内介入栓塞术后发生脑梗死的风险为无水肿的 1.960 倍。水肿和脑积水可引起患者颅内压升高,影响患者脑组织和神经功能,并影响患者脑循环,增加患者术后脑梗死发生风险。颅脑血肿

在局部直接导致凝血系统与抗凝血系统功能的紊乱,导致大量微血栓及纤溶产物的堆积,进而造成血管局部堵塞,直接引发血管内介入栓塞术后脑梗死^[25-40]。

前交通动脉瘤破裂伴蛛网膜下腔出血行血管内介入栓塞术后并发脑梗死影响因素较多,包括神经功能障碍、脑积水、水肿、动脉瘤大小、宽颈动脉瘤、卒中史、高血压史、糖尿病史等,其中水肿、脑积水为常见独立影响因素。临床中针对合并上述影响因素的前交通动脉瘤破裂伴蛛网膜下腔出血患者,在实施血管内介入栓塞术治疗围手术期,应针对性预防和干预,以降低患者术后脑梗死发生风险,保障介入治疗效果及安全性,改善患者预后。

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