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球囊辅助栓塞技术治疗未破裂颅内动脉瘤的有效性及安全性分析*

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摘要 目的:探究球囊辅助栓塞技术治疗未破裂颅内动脉瘤的有效性和安全性。**方法:**选择 2014 年 1 月~2019 年 1 月在本院介入诊疗科接受介入治疗的 540 例患者作为研究对象。根据治疗方案分为两组,球囊辅助栓塞组有 340 例,单纯栓塞组有 200 例。回顾性分析研究对象的一般资料、临床资料、手术并发症等情况。**结果:**球囊辅助栓塞组和单纯栓塞组在性别组成、年龄、颅内动脉瘤性质、位置、Hunt-Hess 分级等方面,差异不具有统计学意义($P>0.05$);在术后即刻及术后 6 个月血管造影结果显示,前者栓塞程度明显优于后者,两组差异具有统计学意义($P<0.05$);前者改良 Rankin 量表评分明显优于后者,两组差异具有统计学意义($P=0.005$);前者预后良好率明显高于后者,两组差异具有统计学意义($P<0.001$);手术过程中,球囊辅助栓塞组发生 2 例破裂出血、2 例脑血管痉挛、1 例弹簧圈移位,单纯栓塞组发生 2 例破裂出血、1 例栓塞、2 例脑血管痉挛、3 例弹簧圈移位。前者并发症发生率明显低于后者,两者差异具有统计学意义($P<0.001$)。**结论:**在治疗未破裂颅内动脉瘤方面,球囊辅助栓塞技术的有效性、安全性明显优于单纯栓塞介入治疗,值得临床推广。

关键词:介入治疗;颅内动脉瘤;球囊辅助栓塞;脑血管痉挛

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Analysis of the Effect of Balloon-assisted Embolization in the Treatment of Unruptured Intracranial Aneurysms*

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ABSTRACT Objective: To explore the effectiveness and safety of balloon-assisted embolization in the treatment of unruptured intracranial aneurysms. **Methods:** From January 2014 to January 2019, 540 patients who received interventional therapy in the interventional department of our hospital were selected as the research subjects. According to the treatment plan, it was divided into two groups, namely, balloon-assisted embolization group (340 cases) and simple embolization group (200 cases). We retrospectively analyzed the general information, clinical data, and surgical complications of all patients. **Results:** The balloon-assisted embolization group and the simple embolization group were not statistically significant in terms of gender composition, age, nature, location of intracranial aneurysm, Hunt-Hess classification ($P>0.05$). The results of angiography immediately after operation and 6 months after operation showed that the embolization degree of the balloon-assisted embolization group was significantly better than that of the simple embolization group, the difference was statistically significant ($P<0.05$). The modified Rankin of the balloon-assisted embolization group The scale score was significantly better than the simple embolization group, the difference was statistically significant ($P=0.005$). The prognosis rate of the balloon-assisted embolization group was significantly higher than that of the simple embolization group, the difference was statistically significant ($P<0.001$). During the operation In the balloon-assisted embolization group, 2 cases of rupture and bleeding, 2 cases of cerebral vasospasm, and 1 case of coil displacement occurred. In the simple embolization group, 2 cases of rupture and bleeding, 1 case of embolization, 2 cases of cerebral vasospasm, and 3 cases of coil displacement. The incidence of complications in the balloon-assisted embolization group was significantly lower than that in the simple embolization group, and the difference was statistically significant ($P<0.001$). **Conclusion:** In the treatment of unruptured intracranial aneurysms, the effectiveness and safety of balloon-assisted embolization technology is significantly better than simple embolization interventional therapy, and it is worthy of clinical promotion.

Key words: Intracranial aneurysm; Balloon-assisted embolization; Interventional therapy

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前言

颅内动脉瘤是由于先天发育异常或后天损伤导致的颅内

血管局限性异常膨出,多发生于 Willis 环附近或血管分叉处^[1-3]。相关研究表明,在亚洲颅内动脉瘤的患病率约为 2.5%~3%,多见于 40~60 岁人群^[4]。未破裂颅内动脉瘤(unruptured intracra-

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nal aneurysms, UIAs)通常为无症状或症状不典型,比如头痛、颅神经麻痹、短暂性脑缺血发作、癫痫及非特异性症状^[5-7],因此容易误诊、漏诊。该疾病危害大,当颅内动脉瘤发生破裂出血时,病死率、致残率极高。颅内动脉瘤的治疗主要分为三大类,即保守治疗、传统手术夹闭治疗和介入治疗(endovascular treatment, EVT)^[8-11]。近年来,随着介入材料的快速发展和介入技术的日臻成熟,介入治疗被广泛认为是一种安全、有效的治疗手段,已经逐渐成为了治疗颅内动脉瘤的首选方法。在临床工作中需要更加充分地了解各种介入材料的性能、介入手段的利与弊,再根据患者颅内血管瘤部位、大小、形态、破裂风险等实际情况选择治疗方案^[12,13]。国内对于球囊辅助栓塞技术治疗疗效研究较少,因此有必要评估该技术治疗未破裂颅内动脉瘤的有效性和安全性,现报道如下。

1 资料与方法

1.1 一般资料

选择 2014 年 1 月~2019 年 1 月在本院介入诊疗科接受介入治疗的 540 例患者作为研究对象。其中男性 216 例(40.00%),女性 324 例(60.00%),年龄范围 25~72 岁,年龄中位值为 52 岁,平均年龄为(48.42±10.06)岁。所有患者根据治疗方案分为两组,即球囊辅助栓塞组(340 例)和单纯栓塞组(200 例)。纳入标准:①经数字减影血管造影(digital subtraction angiography, DSA),CT 血管成像(ct angiography, CTA)及磁共振血管造影(magnetic resonance angiography, MRA)等影像学结果证实为未破裂颅内动脉瘤^[14-16];②无介入治疗禁忌症;③临床资料完整。排除标准:①已接受动脉夹闭等外科治疗;②为夹层、假性、感染性动脉瘤;③有恶性肿瘤、神经精神疾病或严重心脑血管疾病;④近期有颅内出血。

1.2 资料收集

回顾性统计所有患者的一般资料(性别、年龄、既往病史等)、临床资料(发病时间、症状、体征、实验室检查结果、影像学检查结果等)、治疗方法、手术并发症(破裂出血、栓塞等)。

1.3 治疗方法

1.3.1 球囊辅助栓塞 所有患者均在插管全麻下进行栓塞。先以 Seldinger 技术穿刺右侧股动脉。然后行全脑血管造影。栓塞前 10 min 全身肝素化,导引导管选用 Fas - Guide 导管,导引导管置于颈内动脉岩部后将 EV3 的微导管(EV3 Echelon)和与之相匹配的 EV3 微导丝(EV3 Avigo)。头端经过塑形的微导管在微导丝配合下置入瘤腔并固定于距瘤颈 1/3 处,根据瘤体与瘤颈大小,选用相应的弹簧圈(EV3 Axium)在球囊辅助下将弹簧圈依次填入瘤腔直至动脉瘤不再显影,弹簧圈每次解脱前均行造影,确认载瘤动脉通畅后方可解脱。

1.3.2 单纯栓塞 所有患者均在插管全麻下进行栓塞。先以 Seldinger 技术穿刺右侧股动脉。然后行全脑血管造影。栓塞前 10 min 全身肝素化,导引导管选用 Fas - Guide 导管,导引导管置于颈内动脉岩部后将 EV3 的微导管(EV3 Echelon)和与之相匹配的 EV3 微导丝(EV3 Avigo)。头端经过塑形的微导管在微导丝配合下置入瘤腔并固定于距瘤颈 1/3 处,根据瘤体与瘤颈大小,选用相应的弹簧圈(EV3 Axium)将弹簧圈依次填入瘤腔直至动脉瘤不再显影,弹簧圈每次解脱前均行造影,确认载瘤动脉通畅后方可解脱。

1.4 效果评价

术前和手术后 6 个月均行 DSA (飞利浦 FD-20)、CTA 或 MRA 检查,评估动脉瘤治疗效果。术后 6 个月进行评估:栓塞程度分级^[17]见表 1,改良 Rankin 量表评分标准^[18]见表 2。

表 1 动脉瘤栓塞程度

Table 1 Degree of aneurysm embolism

Complete embolism	Contrast agent is not developed in aneurysm, embolism> 95 %
Sub-full packing	Contrast agent is developed in the tumor body, packing 80 % ~ 95 %
Partially stuffed	Contrast agent is developed on most tumors and packed <80 %

表 2 改良 Rankin 量表评分标准

Table 2 Scoring criteria of modified Rankin scale

0 score	Asymptomatic
1 score	Mild symptoms, no obvious neurological dysfunction, can complete daily work and life independently
2 score	Mildly disabled, but can still take care of his life
3 score	Moderately disabled, can walk independently, but needs help
4 score	Moderately disabled, unable to walk independently, needs help
5 score	In bed, the lower the total dependence on life, the better the prognosis

1.5 统计学方法

采用 SPSS 20.0 软件进行统计分析。计量资料采用($\bar{x} \pm s$)表示,使用 t 检验;计数资料采用 n(%)表示,使用 χ^2 检验。 $P>0.05$,差异具有统计学意义。

2 结果

2.1 两组患者基线资料对比

对比基线数据,球囊辅助栓塞组和单纯栓塞组在性别组成、年龄、颅内动脉瘤性质、位置、Hunt-Hess 分级等方面,差异不具有统计学意义($P>0.05$),两组资料具有可比性,见表 3。

2.2 两组患者术后栓塞程度对比

在术后即刻及术后 6 个月血管造影结果显示,球囊辅助栓塞组($P<0.05$),见表 4。
塞组栓塞程度明显优于单纯栓塞组,差异具有统计学意义

表 3 两组基线资料对比
Table 3 Comparison of baseline data between the two groups

Project	Factor	Balloon-assisted embolization group	Simple embolism group
n		340	200
Gender	Male	135(39.71)	81(40.50)
	Female	205(60.29)	119(59.50)
Age	Years	48.62± 11.26	47.90± 10.59
Property	Single	52(15.29)	29(14.50)
	Multiple	288(84.71)	171(85.50)
Position	Posterior communicating artery	84(24.71)	49(24.50)
	Internal carotid artery	61(17.94)	37(18.50)
	Anterior communicating artery	78(22.94)	46(23.00)
	Middle cerebral artery	31(9.12)	19(9.50)
	Anterior cerebral artery	23(6.76)	15(7.50)
	Vertebrobasilar system	63(18.53)	34(17.00)
	I	118(34.71)	71(35.50)
	II	75(22.06)	43(21.50)
Hunt-Hess classification	III	78(22.94)	45(22.50)
	IV	41(12.06)	23(11.50)
	V	28(8.24)	18(9.00)

表 4 两组术后即刻及 6 个月随访中栓塞程度对比(例,%)

Table 4 Comparison of embolization degree between the two groups immediately after operation and 6-month follow-up (n,%)

Embolism	Immediately after surgery		6 months after operation	
	Balloon-assisted embolization group	Simple embolism group	Balloon-assisted embolization group	Simple embolism group
Complete embolism	254(74.71)*	130(65.00)	251(73.82)*	125(62.50)
Sub-full packing	61(17.94)	31(15.50)	62(18.24)	33(16.50)
Partially stuffed	25(7.35)*	39(19.50)	27(7.94)*	42(21.00)

Note: compare the simple embolism group,* $P<0.05$.

2.3 两组患者改良 Rankin 量表评分对比

球囊辅助栓塞组改良 Rankin 量表评分明显优于单纯栓塞组,两组差异具有统计学意义($P=0.005$);当评分为 0~1 时,表明预后良好,结果显示,球囊辅助栓塞组预后良好率明显高于单纯栓塞组,差异具有统计学意义($P<0.001$),见表 5。

2.4 两组患者术中并发症对比

手术过程中,球囊辅助栓塞组发生 2 例破裂出血、2 例脑血管痉挛、1 例弹簧圈移位,单纯栓塞组发生 2 例破裂出血、1 例栓塞、2 例脑血管痉挛、3 例弹簧圈移位。球囊辅助栓塞组并发症发生率明显低于单纯栓塞组,两组差异具有统计学意义($P<0.001$),见表 6。

3 讨论

颅内动脉瘤(intracranial aneurysm,IA)是一种由于血管异常膨出引起的脑血管疾病^[19]。该病发病机制尚不明确,现在普遍认为多因素共同作用的结果,例如遗传因素、高血压、创伤、动脉粥样硬化等,加之脑血管解剖特点,例如脑血管弹力层薄弱、中膜平滑肌细胞数目少、外膜弹力纤维较薄等因素^[20-23]。颅内动脉瘤是引起自发性蛛网膜下腔出血(Spontaneous subarachnoid hemorrhage,s-SAH)的重要疾病,首次破裂出血后死亡率为 40%,再次出血死亡率为 60%~70%。本研究结果显示,男性 216 例,女性 324 例,男女比为 1:1.5,女性发病率高于男性,与 Jee 等人的研究结果相似^[24]。年龄范围 25~72 岁,平均年龄为(48.42±10.06)岁,符合该病的好发人群所处的年龄阶段。

随着介入材料 and 手段的发展,介入治疗技术越来越成熟,已被认为是治疗颅内动脉瘤的首选治疗方式^[25,26]。临床工作中

表 5 两组患者改良 Rankin 量表评分对比(例,%)

Table 5 Comparison of modified Rankin scale scores between two groups (n,%)

Scale score	Balloon-assisted embolization group(n=340)	Simple embolism group(n=200)	χ^2	P
0 score	266(78.24)	135(67.50)	16.750	0.005
1 score	42(12.35)	19(9.50)		
2 score	16(4.71)	22(11.00)		
3 score	13(3.82)	21(10.50)		
4 score	3(0.88)	3(1.50)		
5 score	0(0)	0(0)	8.142	<0.001
Eusemia	308(90.59)	154(77.00)		

表 6 两组患者术中并发症对比(例,%)

Table 6 Comparison of intraoperative complications between the two groups (n,%)

Intraoperative complications	Balloon-assisted embolization group(n=340)	Simple embolism group(n=200)	χ^2	P
Rupture bleeding	2(0.59)	2(1.00)	8.269	<0.001
embolism	0(0)	1(0.50)		
Cerebral angiospasm	2(0.59)	2(1.00)		
Spring coil shift	1(0.29)	3(1.50)		
Total	5(1.47)	8(4.00)		

我们通常根据动脉瘤的大小、形态、部位来作为评估治疗手段的依据。球囊辅助弹簧圈在 20 世纪 90 年代开始被应用于治疗颅内动脉瘤。随着弹簧圈栓塞技术的发展,球囊辅助栓塞技术被应用于宽颈动脉瘤的栓塞治疗。其治疗操作的大致过程为:填圈过程中球囊在瘤颈口处打开,填圈的过程中球囊保持充盈,然后泄掉球囊,检查弹簧圈栓子团的位置和稳定情况,充盈球囊,解脱弹簧圈。但介入治疗过程中,最常见的并发症是出血和栓塞,其次是脑血管痉挛等并发症^[27,28]。一项包含 101 例连续病例单中心研究发现,球囊辅助栓塞的病例具有较高的栓塞密度^[29],这均表明与传统介入手术相比,球囊辅助栓塞技术具有明显的优势:① 患者在术围手术期不用长期服用抗血小板药物;② 由于球囊柔软,患者不易发生动脉迟发性痉挛;③ 该治疗方式能够保护载瘤动脉;④ 维持微导管稳定,在急性期更有优势^[30];⑤ 有利于瘤颈部位弹簧圈的成篮和致密栓塞。在李明昌^[31]等的研究中,对球囊或支架辅助弹簧圈栓塞颅内宽颈动脉瘤的安全性及有效性进行了 Meta 分析,表明球囊与支架辅助弹簧圈两种技术栓塞颅内宽颈动脉瘤均具有较好的有效性与安全性。

本研究结果显示,球囊辅助栓塞组栓塞程度、改良 Rankin 量表评分、预后良好率明显优于单纯栓塞组,而前者并发症发生率明显低于后者,差异均具有统计学意义。与以往研究相比,本研究中术后跟踪时间较长,为术后 6 个月,且纳入研究的患者样本量较大,保证了数据偏离误差程度较小,从而为临床工作的开展提供重要参考依据,但本研究也存在一定的局限,包括对照组只是选择单纯栓塞者,可选择其他栓塞技术进行多样化对比,此外可将随访时间进一步延长,对两组的复发率进行对比。

综上所述,球囊辅助栓塞技术作为一种神经介入手段,在辅助弹簧圈栓塞未破裂颅内动脉瘤时具有独到的优势,它的有效性和安全性明显优于单纯栓塞介入治疗,值得临床推广。

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