

颅内动脉瘤栓塞术后复发的手术治疗

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【摘要】 研究背景 血管内介入治疗是目前颅内动脉瘤的首选治疗方法,但复发率较高,部分患者因再次栓塞困难须行手术夹闭治疗。本文回顾分析行手术夹闭治疗的 11 例栓塞不全或复发的颅内动脉瘤患者的临床资料,结合国内外相关文献报道,探讨手术治疗原则和技巧。**方法** 11 例栓塞不全或复发的颅内动脉瘤患者共有 12 个动脉瘤,其中前交通动脉动脉瘤 3 个,大脑中动脉动脉瘤 3 个,后交通动脉动脉瘤 2 个,大脑前动脉、椎动脉、基底动脉尖端和小脑上动脉动脉瘤各 1 个;小动脉瘤 7 个,大动脉瘤 4 个。所有患者均于手术显微镜下行动脉瘤夹闭术,11 个夹闭完全,1 个行椎动脉近端阻断术;术中 7 个动脉瘤内弹簧圈予以保留,5 个予以去除或部分去除。**结果** 所有患者术后平均随访 22 个月,Glasgow 预后分级评分较术前增加或无变化 9 例(9/11),其中 1 例术后左侧肢体肌力减退,肌力 3 级,出院时恢复至 4~5 级;2 例死亡,1 例术前病情较重、出院后即死亡,1 例载瘤动脉血栓形成、继发肺炎死亡。**结论** 血管内介入治疗后复发动脉瘤具有较高的手术难度,只要进行充分的术前评估和手术方案设计,手术夹闭治疗依然能够取得安全有效的效果。

【关键词】 颅内动脉瘤; 栓塞,治疗性; 复发; 显微外科手术; 血管外科手术

Surgical management of recurrent intracranial aneurysms after embolization

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【Abstract】 **Background** Endovascular therapy is the first treatment choice for intracranial aneurysms currently, but it has a high recurrence rate. Some patients require surgical clipping because of the difficulty of re-embolization. This study retrospectively analyzed the clinical data of 11 cases who underwent clipping operation because of the recurrence after endovascular therapy. Combining with domestic and foreign related literatures, this paper discusses the principles and techniques of surgical treatment for recurrent aneurysms. **Methods** There were a total of 11 patients with 12 recurrent aneurysms after embolization, including 3 anterior communicating artery (ACoA) aneurysms, 3 middle cerebral artery (MCA) aneurysms, 2 posterior communicating artery (PCoA) aneurysms, one anterior cerebral artery (ACA) aneurysm, one vertebral artery (VA) aneurysm, one basilar tip aneurysm and one superior cerebellar artery (SCA) aneurysm. There were 7 small aneurysms and 4 large aneurysms. All patients underwent surgical clipping under microscope. After operation, 11 aneurysms were complete clipped, and one was proximally blocked. The coils were reserved in 7 aneurysms, and were removed or partially removed in 5 aneurysms. **Results** All patients were followed up for an average of 22 months after surgery. There were 9 cases (9/11) with the Glasgow Outcome Scale (GOS) score improved or remaining unchanged compared with preoperation. One of them presented left limb weakness after operation, with the muscle strength Grade 3, while recovered to Grade 4-5 on discharge. The other 2 patients died after surgery. One case had a critical condition before surgery, and the other was secondary to thrombosis and pneumonia. Both of them had a GOS score of 2 when discharged, and died after discharge. **Conclusions** There is high surgical difficulty in recurrent aneurysms, however, with adequate preoperative evaluation and surgical design, it can still promise safe and effective results.

【Key words】 Intracranial aneurysm; Embolization, therapeutic; Recurrence; Microsurgery; Vascular surgical procedures

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电解脱式弹簧圈(GDC)的应用使颅内动脉瘤的栓塞治疗飞速发展,特别是2002年,国际动脉瘤性蛛网膜下隙出血试验(ISAT)协作组发表在 *Lancet* 的前瞻性研究显示,颅内动脉瘤血管内介入治疗患者1年内并发症发生率低于手术治疗患者^[1],使血管内介入治疗成为国内外颅内动脉瘤的首选方案。然而较高的栓塞残留率和复发率一直是血管内介入治疗至今未能解决的技术难题,部分栓塞不全或复发的动脉瘤需再次治疗^[2],当再次栓塞困难或难以实现时,手术夹闭成为此类患者的唯一治疗措施。目前,国内对血管内介入治疗后复发颅内动脉瘤的手术治疗原则和方法仅有少量文献报道,且无统一标准。鉴于此,解放军总医院神经外科回顾分析2007年6月-2014年6月施行动脉瘤夹闭术的11例血管内介入治疗后复发患者的临床资料,结合国内外相关文献报道,探讨此类疾病的手术治疗原则和技巧。

资料和方法

一、临床资料

共11例栓塞不全或复发的颅内动脉瘤患者,男性4例,女性7例;年龄38~71岁,平均52岁;血管内介入治疗至复发时间2~36个月,平均13.30个月;入院时Glasgow预后分级(GOS)评分2~5分,平均4.36分;6例于复查时发现动脉瘤复发,2例表现为头晕、头痛,2例发生动脉瘤再次破裂出血,1例有明显占位效应,其中3例曾在本院行血管内介入治疗。本组11例患者共12个动脉瘤,栓塞不全3个,栓塞程度分别为85%、90%和70%;复发9个,表现为弹簧圈回缩2个、动脉瘤再生长7个。前交通动脉动脉瘤3个(例1、例5、例8),大脑中动脉动脉瘤3个(例3、例9、例10),后交通动脉动脉瘤2个(例6、例11),大脑前动脉动脉瘤1个(例3),椎动脉动脉瘤1个(例2)、基底动脉尖端动脉瘤1个(例7)、小脑上动脉动脉瘤1个(例4)。术前有10例患者(11个动脉瘤)行脑血管造影检查,分别测量动脉瘤顶高和颈宽,按照动脉瘤分类标准(小动脉瘤直径<10 mm、大动脉瘤10~25 mm、巨大动脉瘤>25 mm)分为小动脉瘤7个,大动脉瘤4个;余1例因蛛网膜下隙出血破入脑室入院,病情严重,术前仅行CTA检查。11例患者的临床资料详见表1。所有患者均经手术治疗组和血管内介入治疗组专家行严格术前评估,认为再次栓塞困难,或家属手术意愿强烈。

二、手术方法

所有患者均于手术显微镜下行动脉瘤夹闭术。前循环复发动脉瘤9个,采取额颞叶入路,其中1例(例3)有2个动脉瘤而采取额颞叶与前纵裂联合入路(图1);后循环复发动脉瘤3个,采取翼点与颞下联合入路或枕下极外侧入路。12个动脉瘤中11个夹闭完全;余1个(例2)因与小脑后下动脉和周围分支血管分界不清,夹闭困难,临时阻断椎动脉近端,术中电生理学监测脑干听觉诱发电位(BAEP)未见明显变化,超声多普勒显示小脑后下动脉动脉瘤血流良好,故行椎动脉近端阻断术。术中7个动脉瘤内弹簧圈予以保留,5个予以去除或部分去除。

三、预后评价

所有患者均于术后2、18、48个月时采用电话随访方式进行GOS评分,并于术后24和48个月时复查脑血管造影或CTA。最后一次随访时GOS评分较术前增加或无变化,为预后良好;较术前减少,为预后不良。同时观察患者术后短期和随访过程中有无肺炎、头痛、肌力减退、偏瘫、失语等并发症。

结 果

所有患者术后随访2~48个月,平均22个月;GOS评分1~5分,平均4.18分,较术前增加或无变化(预后良好)9例(9/11),其中1例(例10)术后左侧肢体肌力减退,肌力3级,复查CT未见明显梗死灶,住院期间肌力逐渐恢复,出院时恢复至4~5级;2例死亡,其中1例(例1)术前病情较重,Hunt-Hess分级5级,出院后即死亡,1例(例2)因载瘤动脉血栓形成致病情加重,术后20 d继发肺炎死亡。

讨 论

血管内介入治疗已经成为颅内动脉瘤的主要治疗方法之一,以微创、平均住院时间短为突出特点^[1],尤其是近几年支架和球囊辅助栓塞技术的发展,使血管内介入治疗的适应证进一步放宽^[3-5]。然而,长期随访研究显示,颅内动脉瘤栓塞不全、复发和再通发生率高达14%~33%^[2,6-9],这些动脉瘤仍有较高的再次破裂出血概率(0.10%~0.40%)^[2,8]或产生明显的占位效应^[10],对患者生命安全和生活质量造成威胁。

血管内介入治疗后复发的颅内动脉瘤根据其形成原因和术前形态分别采取保守治疗、再次栓塞

表 1 11 例栓塞不全或复发颅内动脉瘤患者临床特点及手术夹闭效果

Table 1. The clinical features and surgical outcome of 11 cases with incomplete coiled or recurrent aneurysms

Case	Sex	Age (year)	Location	Size (mm)	Clinical symptom	Interval (month)*	Preoperative GOS (score)	Surgery	Coils	Hospital stay (d)#	Discharge GOS (score)	Follow-up	
												Time (month)	GOS (score)
1	Female	44	ACoA	11.10 × 7.70	SAH, breaking into the ventricle	2	2	Clipped	Removed	29	2	2	1
2	Male	54	LVA	10.60 × 8.40	Unilateral limb muscle weakness	5	4	Proximal blocking	Reserved	40	2	2	1
3	Male	38	LACAA2 LMCAB	2.50 × 3.50 3.10 × 5.30	Aneurysm growth	36	5	Clipped	Reserved or removed	7	5	8	5
4	Female	46	LSCA	1.30 × 1.90	Coil contraction	3	5	Clipped	Removed	7	5	10	5
5	Female	57	ACoA	3.20 × 2.70	Dizziness	36	5	Clipped	Removed	7	5	10	5
6	Female	45	RPCoA	3.80 × 10.50	Aneurysm growth	4	5	Clipped	Removed	20	5	12	5
7	Female	60	TBA	3.40 × 4.50	Aneurysm growth	6	4	Clipped	Removed	10	4	21	4
8	Male	71	ACoA	—	SAH	7	3	Clipped	Removed	13	4	39	5
9	Female	60	RMCA	2.60 × 2.40	Headache	11	5	Clipped	Removed	7	5	43	5
10	Male	48	RMCA	4.10 × 11.30	Coil contraction	12	5	Clipped	Reserved	16	5	48	5
11	Female	49	LPCoA	3.70 × 2.60	Aneurysm growth	24	5	Clipped	Reserved	8	5	48	5

*interval from embolization to clipping, 动脉瘤栓塞至夹闭时间间隔; #postoperative hospital stay, 术后住院时间。—, not done, 未测量。GOS, Glasgow Outcome Scale, Glasgow 预后分级; ACoA, anterior communicating artery, 前交通动脉; LVA, left vertebral artery, 左侧椎动脉; LACAA2, left anterior cerebral artery A2 segment, 左侧大脑前动脉 A2 段; LMCAB, left middle cerebral artery bifurcation, 左侧大脑中动脉分叉部; LSCA, left superior cerebellar artery, 左侧小脑上动脉; R/LPCoA, right/left posterior communicating artery, 右侧/左侧后交通动脉; TBA, tip of basilar artery, 基底动脉尖端; RMCA, right middle cerebral artery, 右侧大脑中动脉; SAH, subarachnoid hemorrhage, 蛛网膜下隙出血

或手术夹闭治疗^[9],其中,保守治疗仅适用于残留或复发动脉瘤小且长期复查无明显变化者;对于再次破裂出血、瘤体有增长趋势、分叶状或明显占位效应的动脉瘤应及时处理^[8,10-11],但目前国内外尚无统一标准,我们根据复发动脉瘤形成原因,将下一步处理措施分为以下几类:(1)急性期不完全栓塞。以蛛网膜下隙出血(SAH)发病的颅内动脉瘤,由于急性期患者身体条件和亟待处理的问题,多以暂时性止血为主要目的,部分患者未行完全栓塞,待病情稳定后再次栓塞,此类残留动脉瘤短期内形态不会发生明显变化,再次栓塞仍为首选,若栓塞不成功可行手术夹闭治疗。(2)栓塞不完全。对于动脉瘤栓塞不完全的患者,只有明显残留者需即刻再次处理,大部分微小残留者仅需定期复查CTA或脑血管造影观察动脉瘤形态变化,若呈分叶状需尽早再次栓塞或夹闭治疗。(3)复发动脉瘤再生长。此类动脉瘤极不稳定,有很高的再次破裂出血风险或日渐加重的占位效应,再次栓塞效果相对较差,手术夹闭通常可取得较好效果。(4)弹簧圈脱落。此类动脉瘤再次栓塞和手术夹闭难度均较大,但再次栓塞弹簧圈脱落风险较高,手术显微镜下可根据具体情况采取直接夹闭、取出弹簧圈夹闭、血管搭桥、包裹等不同处理方式。(5)弹簧圈收缩。弹簧圈收缩

形态不同、治疗方案不同,充分的术前影像学资料和多学科联合是治疗成功的关键。

对于需行手术治疗的复发动脉瘤,术中是否去除弹簧圈一直存有争议,大多数研究显示,在不去除弹簧圈能完全夹闭且又不存在占位效应的情况下,保留弹簧圈可以避免血管撕裂等危险情况的发生^[6,12]。而且对于栓塞时间较长的弹簧圈,周围炎症反应严重,弹簧圈与动脉瘤粘连紧密,去除弹簧圈相当困难。但是对于栓塞时间较短的弹簧圈,可以根据术中情况在不增加手术风险的情况下予以去除。对于存在占位效应的弹簧圈,应尽量去除以缓解压迫症状。部分瘤顶高较小的动脉瘤,虽不存在占位效应,但阻碍动脉瘤夹的闭合,去除弹簧圈非常必要,否则动脉瘤夹容易脱落至载瘤动脉,有研究显示,动脉瘤顶高 ≥ 1.50 mm是手术夹闭的界限, < 1.50 mm需术中去除弹簧圈以释放操作空间,避免动脉瘤夹脱落^[13],我们的手术经验也认同此种观点。本组例4患者动脉瘤顶高1.30 mm,术中阻碍动脉瘤夹闭合,故去除弹簧圈,行完全夹闭;例5、例7、例8、例10、例11患者动脉瘤顶高均 > 1.50 mm,有充足的操作空间,故直接行完全夹闭;例3患者弹簧圈脱落至瘤颈和载瘤动脉,尽管动脉瘤顶高足够,但仍影响动脉瘤夹的闭合,此时尽管不能全部去除

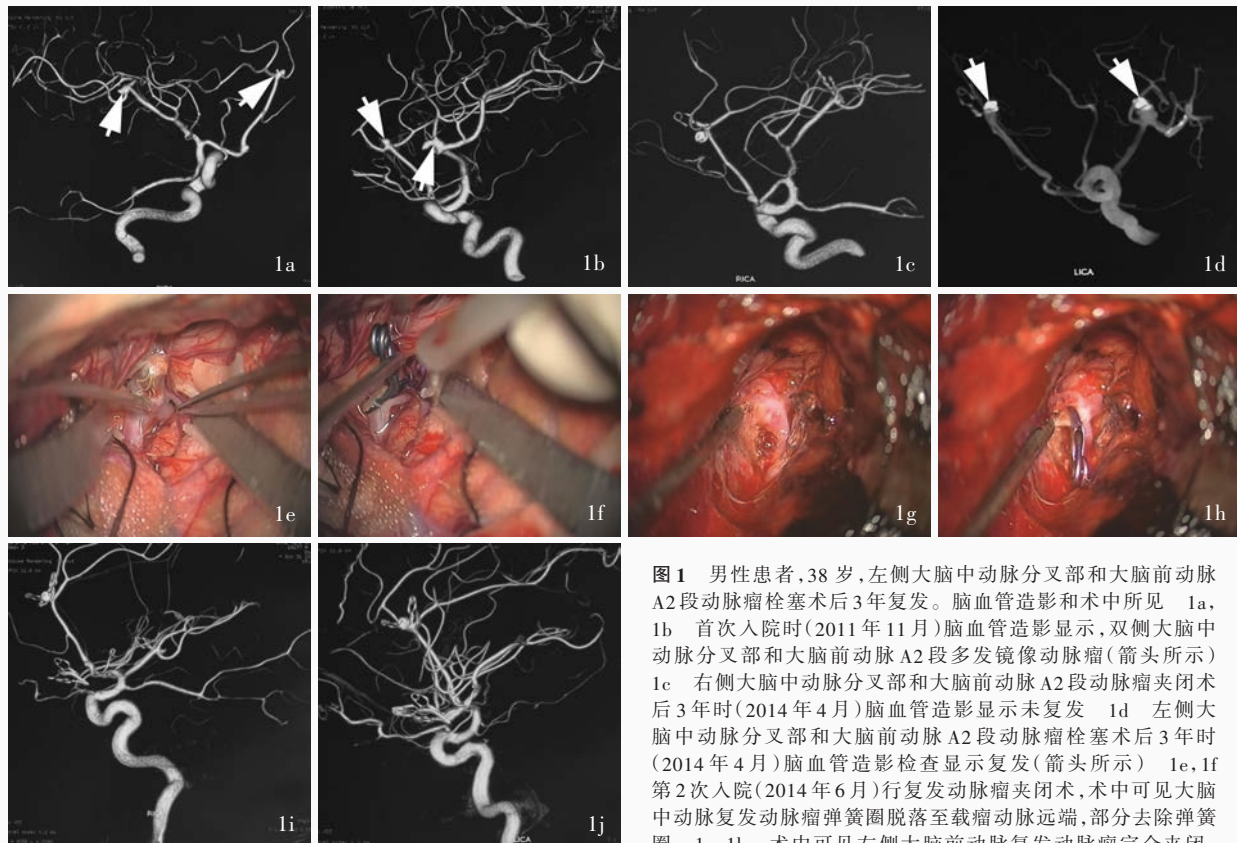


图1 男性患者,38岁,左侧大脑中动脉分叉部 and 大脑前动脉A2段动脉瘤栓塞术后3年复发。脑血管造影和术中所见 1a, 1b 首次入院时(2011年11月)脑血管造影显示,双侧大脑中动脉分叉部 and 大脑前动脉A2段多发镜像动脉瘤(箭头所示) 1c 右侧大脑中动脉分叉部 and 大脑前动脉A2段动脉瘤夹闭术后3年时(2014年4月)脑血管造影显示未复发 1d 左侧大脑中动脉分叉部 and 大脑前动脉A2段动脉瘤栓塞术后3年时(2014年4月)脑血管造影检查显示复发(箭头所示) 1e, 1f 第2次入院(2014年6月)行复发动脉瘤夹闭术,术中可见大脑中动脉复发动脉瘤弹簧圈脱落至载瘤动脉远端,部分去除弹簧圈 1g, 1h 术中可见左侧大脑前动脉复发动脉瘤完全夹闭,

弹簧圈部分保留 1i, 1j 术后10 d复查脑血管造影显示,双侧镜像动脉瘤夹闭完全

Figure 1 A 38-year-old male patient had recurrent left MCA bifurcation and A2 segment of left ACA aneurysms 3 years after embolization. DSA and intraoperative findings. DSA on the first admission (November 2011) showed multiple mirror aneurysms of bilateral MCA bifurcation and A2 segment of ACA (arrows indicate; Panel 1a, 1b). The patient underwent left aneurysms embolization and right aneurysms clipping (December 2011). Three years later, DSA (April 2014) showed no recurrence of clipped aneurysms (Panel 1c), but recurrence of embolized aneurysms (arrows indicate, Panel 1d). On the second admission (June 2014) the patient underwent clipping surgery of the recurrent aneurysms. During the operation, the coils in the recurrent aneurysms fell off to the distal of the parent artery, and partial coils were removed (Panel 1e, 1f). During the operation, the left recurrent MCA and ACA aneurysms were completely occluded, and partial coils in the aneurysms were reserved (Panel 1g, 1h). DSA of 10 d after surgery showed bilateral mirror aneurysms were clipped completely (Panel 1i, 1j).

弹簧圈,但部分去除可以增强夹闭效果(图1)。

已行栓塞治疗的动脉瘤在很多方面均与未行栓塞治疗的动脉瘤有很大差异,甚至术前影像学检查无法准确评价,例如本组例2患者术前影像学评价动脉瘤手术夹闭可行性高,但术中发现动脉瘤壁因炎症反应与小脑上动脉起始部重度粘连,临时阻断椎动脉近端,术中电生理学监测和超声多普勒均无明显改变,故采取椎动脉近端阻断术,但术后出现血栓脱落,属临床少见^[6]。提示处理血管内介入治疗后复发动脉瘤时,不仅需要作好充分的术前评估,术中同样需要多项备选措施,如巨大动脉瘤难以夹闭时可能需要血管搭桥,小动脉瘤难以夹闭时需包裹加固^[10],只有掌握处理各种复发情况的手术技巧,才能确保在安全有效的情况下实施手术治

疗。因此,充分认识复发动脉瘤的复杂性,掌握这些手术技巧,才能尽可能减少手术并发症,这也是手术治疗复发动脉瘤的优点,可直视动脉瘤情况,减少不确定性预后的发生。

随着血管内介入治疗技术由大型医院向地方医院的普及和时间的推移,栓塞术后复发患者将日益增多,但大部分地方医院尚无足够的手术经验和先进的设备行动脉瘤夹闭治疗,这部分患者必然转向大型医院,就需要我们对此类疾病有更加充分的认识^[14]。

随着颅内动脉瘤血管内介入治疗的普及及其高复发率,复发动脉瘤的手术治疗将成为神经外科医师的一种新挑战,面对这种复杂情况,多学科联合的术前评估非常必要,同时需具备多种手术技巧

才能应对术中可能出现的各种复杂情况。栓塞时间较长的弹簧圈应尽量保留,可减少不必要的术后并发症,而栓塞时间较短的弹簧圈,可根据术中情况予以去除或保留。但对于动脉瘤顶高 < 1.50 mm 的动脉瘤,只有去除弹簧圈才能释放出充分的夹闭空间,避免因动脉瘤夹脱落而阻断载瘤动脉;有占位效应的动脉瘤,去除弹簧圈可以减轻压迫症状。

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中国脑卒中大会 2015 暨第五届全国心脑血管病论坛征文通知

由国家卫生计生委脑卒中防治工程委员会和中华预防医学会主办的“中国脑卒中大会 2015 暨第五届全国心脑血管病论坛”拟定于 2015 年 5 月 7-10 日在北京市国家会议中心召开。

大会继续秉承权威性、前瞻性、学术性、专业性的特点,邀请相关领导和国内外心脑血管病相关领域院士、著名专家作专题报告,为“十三五”时期心脑血管病防治布局,并发布我国近年来脑卒中筛查与干预重要数据和国内外领先学术成果。内容包括:脑卒中基础研究;脑卒中中西医结合研究;脑卒中内科诊断与治疗;脑卒中外科干预与介入治疗;脑卒中流行病学调查;脑卒中影像学;脑卒中检验学;血管超声、经颅多普勒超声(TCD)与脑卒中;糖尿病与脑卒中;血脂异常与脑卒中;高血压与脑卒中;心房颤动与脑卒中;脑卒中康复治疗;脑卒中护理;医院管理;其他。欢迎全国同道积极参会,踊跃投稿,与会者将授予国家级继续医学教育 I 类学分 8~10 分。

1. 征文内容 脑卒中筛查、心脑血管病基础与临床研究。

2. 征文要求 尚未在国内外学术会议和公开刊物上发表的论著、综述或个案报道摘要 1 份,字数 500~1000 字,要求科学性、重点突出、数据可靠、结论恰当、文字通顺精炼。请按照目的、材料与方法、结果、结论四部分格式书写,并于文题下注明作者姓名(第一作者和通讯作者)、工作单位、邮政编码、联系方式 and Email 地址。优秀论文将择期推荐至《中华神经科杂志》、《中国现代神经疾病杂志》、《中国脑血管病杂志》、《中国卒中杂志》等相关学术期刊发表。

3. 投稿方式 会议仅接受 Email 投稿,请以附件形式(Word 文件)发送至 csc_zw@126.com,并在邮件中注明作者联系方式。

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