

弹簧圈血管内栓塞颅内动脉瘤危急事件中支架的应用

顾斌贤, 李明华, 王 武

【摘要】 目的 探讨在血管内弹簧圈栓塞颅内动脉瘤过程中出现弹簧圈移位、突出或脱出和解旋等危急事件的原因及支架应用的价值。**方法** 回顾性分析 12 例弹簧圈栓塞颅内动脉瘤出现危急事件的病例, 其中 9 例为宽颈动脉瘤; 10 例出现动脉瘤破裂出血; 2 例动脉瘤最大径为 5 ~ 12 mm, 7 例为 3 ~ 5 mm, 3 例 < 3 mm; 造影和临床随访超过 18 个月。**结果** 危急事件为弹簧圈移位 3 例, 突出或脱出 7 例, 解旋 2 例。处理方法为 8 例植入了支架, 无一例出现缺血事件; 未植入支架的 4 例中解旋 1 例, 成功回收, 突出或脱出 3 例。术后 2 例出现缺血事件。随访造影未见支架内狭窄和再出血事件。**结论** 利用支架处理这些危急事件可行、有效; 弹簧圈的危急事件与弹簧圈与动脉瘤大小不匹配、后置弹簧圈填塞、过度填塞和微导管操作等因素有关。

【关键词】 支架; 颅内动脉瘤; 弹簧圈; 血管内治疗; 移位; 突出; 解旋

中图分类号: R743 文献标志码: A 文章编号: 1008-794X(2011)-02-0093-04

Management of stent for an emergency situation during coil embolization of intracranial aneurysms

GU Bin-xian, LI Ming-hua, WANG Wu. Department of Diagnostic and Interventional Neuroradiology, the Affiliated Sixth People's Hospital, School of Medicine, Shanghai Jiaotong University, Shanghai 200233, China

Corresponding author: LI Ming-hua

【Abstract】 Objective The purpose of this study is to evaluate the efficacy of stent for endovascular treatment of an emergency situation such as coil migration, coil herniation, prolapsed coil and stretched coil during coil embolization of intracranial aneurysms, and to summarize the possible mechanisms of these emergency situations. **Methods** The records of 12 patients, who received coil embolization for intracranial aneurysms and developed emergent complications during the embolization procedures, were retrospectively reviewed. Wide-neck aneurysms were found in 9 and subarachnoid hemorrhages in 10 patients. The maximum diameter of the aneurysms was 3 mm or less in 1, 3 - 5 mm in 7 and 5 - 12 mm in 2 patients. All patients were evaluated by angiographic and clinical follow-up for 18 months or more. **Results** Coil migration was found in 3, coil herniation in 7 and stretched coil in 2 patients. Eight patients were treated with stenting, and no ischemic stroke occurred. Of the four patients, who were treated without stent, stretched coil was seen in one, which was successfully retrieved, coil herniation was seen in 3, and ischemic stroke occurred in two. No re-bleeding or in-stent stenosis occurred during the follow-up period. **Conclusion** Stents can be used as a feasible and effective tool to treat these emergency situations, which occasionally occur during endovascular embolization for intracranial aneurysms. The occurrence of these emergent events is related to the undersized coil and incompatible diameter to that of the aneurysms, which causes the moving of the coil and subsequent coil embolization, and is also related to the excessive embolization and microcatheter-related problems. (J Intervent Radiol, 2011, 20: 93-96)

【Key words】 stent; intracranial aneurysm; coil; endovascular treatment; migration; herniation; stretch

血管内弹簧圈栓塞已成为治疗颅内动脉瘤首选方法,可以降低早期再出血率、致残率和病死率,

其有效性已得到公认^[1-3]。但随着血管内弹簧圈栓塞治疗颅内动脉瘤病例的日益增多,对其危急事件也有了进一步的认识,弹簧圈移位、突出或脱出、解旋成为主要的技术性并发症,可导致潜在的缺血并发

症^[4-6],及时认识和熟悉紧急处理这一危急事件非常重要。文献报道的紧急处理方法涉及弹簧圈捕捉系统、球囊辅助和支架辅助等技术以及外科手术切开取圈等^[7-15],现就本中心的经验报道如下。

1 材料与方法

1.1 一般资料

回顾性分析 12 例血管内弹簧圈栓塞治疗颅内动脉瘤过程中出现弹簧圈移位、突出或脱出和解旋的病例。12 例中男 7 例,女 5 例,年龄 33 ~ 66 岁,中位年龄 47 岁。10 例破裂出血;9 例为宽颈动脉瘤;2 例动脉瘤最大径为 5 ~ 12 mm,7 例为 3 ~ 5 mm,3 例 < 3 mm;动脉瘤位于前交通动脉 3 例,大脑中动脉 M1 段 1 例,后交通动脉 5 例,床突段动脉 2 例,基底动脉顶端 1 例。12 例中 3 例合并其他部位动脉瘤。12 例患者蛛网膜下腔出血均经 CT 证实,术前经 MRA 证实动脉瘤及其位置。

1.2 方法

1.2.1 血管内治疗术 DSA 脑血管造影和治疗过程相同于我们以前的报道^[5,16-17]。

1.2.2 危急事件的处理原则与方法 用最简单、快捷的方法降低缺血事件的发生,尽早发现弹簧圈不稳定,必要时更换弹簧圈,尽早使用球囊辅助技术,弹簧圈解脱前尽量回收弹簧圈,解脱后尽可能稳定弹簧圈,及时引入支架,并给予足量的抗凝治疗。

我们中心的经验是一旦发现弹簧圈成篮或堵塞不稳定,立即停止微导管和弹簧圈操作,及时引入球囊辅助弹簧圈栓塞;载瘤动脉血流受阻,紧急植入支架恢复远端脑血流;一旦弹簧圈突出或脱出至载瘤动脉,尝试使用微导管技术或球囊辅助技术使弹簧圈回纳到动脉瘤瘤腔,否则应用支架治疗;一旦出现弹簧圈解旋拉丝,停止所有操作,使用球囊辅助技术回收弹簧圈,否则应用支架治疗。

1.2.3 围手术期处理 所有动脉瘤破裂出血患者急诊进行血管内治疗,术后复查头颅 CT 后口服阿司匹林 100 mg/d 和氯吡格雷 75 mg/d 抗血小板聚集治疗,而未破裂动脉瘤患者术前 3 d 口服阿司匹林 100 mg/d 和氯吡格雷 75 mg/d 治疗,术后连续口服 3 个月,复查脑血管造影后改为阿司匹林 100 mg/d,建议终生服药^[16-17]。

1.2.4 随访 术后 1、3、7 和 14 d 评价临床症状,出院前至少行 1 次头颅 CT 检查。出院后 3 ~ 6、9 ~ 12 和 15 ~ 24 个月分别常规复查脑血管造影评价血管内治疗的疗效。

2 结果

植入支架 8 例,术后无一例出现脑缺血和再出血事件;2 例支架辅助弹簧圈栓塞(其中 1 例双支架辅助),3 例球囊辅助栓塞,1 例采用双微导管技术栓塞,2 例单纯性弹簧圈栓塞;宽颈动脉瘤 6 例,弹簧圈移位 3 例,弹簧圈突出或脱出病例 4 例,弹簧圈解旋拉伸 1 例。

未植入支架的 4 例中解旋 1 例,成功回收;突出或脱出 3 例。术后 2 例出现缺血事件,其中 1 例短暂性脑缺血发作,另 1 例症状性脑梗死。

所有危急事件的原因有宽瘤颈或不规则瘤颈的动脉瘤($n = 10$)、弹簧圈和动脉瘤的大小不匹配($n = 3$)、后置弹簧圈填塞($n = 4$)、过度填塞($n = 2$)和微导管头塑形($n = 3$)(其中 2 例微导管重新塑形)。

所有患者行脑血管造影和临床随访 18 ~ 48 个月,平均 30.5 个月。随访脑血管造影无一例出现支架内狭窄和动脉瘤再通或复发。临床随访无一例再发生与治疗的颅内动脉瘤有关的不良事件,包括脑缺血事件、再出血和载瘤动脉闭塞等(图 1、2)。

3 讨论

血管内弹簧圈栓塞治疗颅内动脉瘤最常见的并发症是血栓栓塞或缺血事件,其发生率可高达 28%,是致残和致死的最主要原因^[18],而弹簧圈危急事件是缺血事件的重要原因之一,尤其是弹簧圈突出和移位,常见于宽颈和不规则瘤颈的动脉瘤^[5-6,11]。虽然弹簧圈的工艺有所改进,而且神经介入医师的技术娴熟,但仍存在弹簧圈移位、误脱、突出或脱出、解旋拉伸等危急事件的个案报道^[4,7-15,19-20]。

尽管大多数情况下弹簧圈的单个筐或袢突出至载瘤动脉,如果弹簧圈无明显搏动,一般不会引起严重的后果,即使单个弹簧圈移位,术后抗凝和(或)抗血小板聚集治疗可以防止缺血事件,但是在动脉瘤破裂急性期应用存在一定的风险^[7,14,16]。本组中未植入支架的 3 例弹簧圈突出病例,其中 1 例术后单纯性抗血小板聚集治疗预防缺血事件,另 2 例合并临近部位血管小动脉瘤,介入治疗存在一定难度,而且存在出血的风险,未进行积极的抗血小板聚集和抗凝治疗,术后发生缺血事件。但最近报道 1 例弹簧圈部分裸露到颈内动脉合并严重血管痉挛的病例,复查造影示载瘤动脉狭窄^[19],这些情况均应采取积极的手段预防缺血事件的发生。

到目前为止,对弹簧圈治疗动脉瘤的危急事件

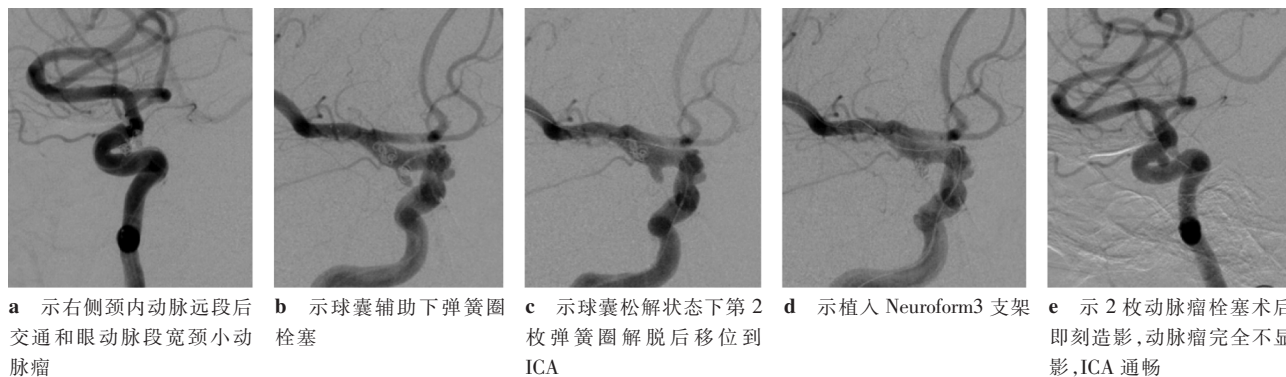


图1 MRA 示颅内多发性动脉瘤危急事件处理

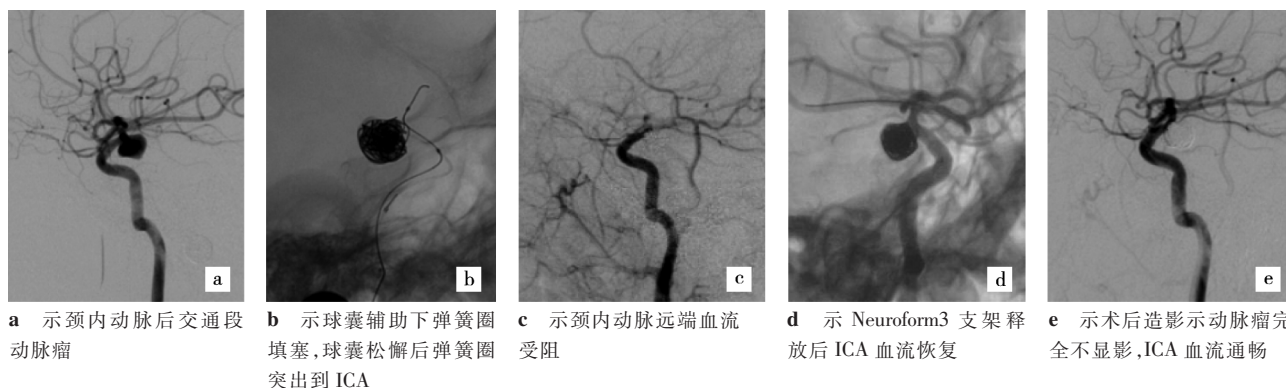


图2 颈内动脉后交通段动脉瘤危急事件处理

仍然缺乏大样本报道和规范性措施,而且每个病例的独特性和每个中心的医师经验决定了其处理方法可能各不相同,包括弹簧圈捕捉系统、球囊辅助、支架辅助技术和外科手术取圈等方法,但是对于神经介入医师来说,及时发现和熟悉如何处理这一紧急事件非常重要。一些学者认为血管内治疗不能及时处理这一危急事件,就应该立即行外科手术切开取圈,以免加重脑缺血^[14-15]。虽然 Kim 等^[14]及时行外科切开术成功取出 5 例患者移位的弹簧圈,并清除血栓和再通闭塞的血管,但外科手术仍存在继发性血管狭窄和闭塞的风险,尤其是急性蛛网膜下腔出血患者,同时使用溶栓药存在再出血的风险,而且对小血管内危急事件仍然不能成功取圈。

血管内治疗技术可以处理相当多的弹簧圈危急事件病例^[4,6-13],应优先选用。危急事件发生在弹簧圈解脱前,优先选择回收或者辅助技术继续填塞,在解脱之后,往往需要紧急处理,可以借助于圈套系统和支架。在本组,所有病例在弹簧圈解脱之后发生危急事件,我们主张使用支架辅助处理。支架辅助弹簧圈栓塞宽颈或不规则瘤颈和大动脉瘤已经取得了中期和长期的疗效,支架作为机械性屏障,可以防止弹簧圈突出到载瘤动脉,稳定动脉瘤内的弹簧圈,而且降低动脉瘤再通并便于瘤颈内皮

化,长期随访显示动脉瘤再通、支架内狭窄和脑缺血事件发生率非常低^[21-22]。

回顾文献,虽然使用 Amplatz 单轨圈套系统成功取出突出和解旋的弹簧圈,但有时使弹簧圈向更远段血管移位,圈套系统操作耗时,失败取圈屡见不鲜,而且加重脑缺血的风险,操作存在血管损伤的可能^[4,6-7,13-14]。有报道用 Alligator 回收装置成功取出移位到大脑后动脉远段的弹簧圈,该装置通过微导管,标配 0.016 英寸导丝,操作优于其他的圈套系统^[20]。而 Lee^[4]报道了他们传奇地使用微导丝(头端塑形形成猪尾巴)成功取出了 2 例移位和解旋拉伸的弹簧圈。众所周知球囊辅助弹簧圈栓塞技术是一个不错的选择,Sugiu 等^[10]报道了使用球囊辅助技术成功处理了 3 例弹簧圈突出的非宽颈小动脉瘤,但仍然存在弹簧圈突出和动脉瘤破裂出血的风险;本组中,4 例球囊辅助弹簧圈栓塞的动脉瘤,仍发生了危急事件,需要植入支架避免缺血事件,但是 1 例在球囊辅助下成功回收解旋的弹簧圈。这两者既耗时又增加脑缺血和血管损伤的风险。

总之,我们的经验是尽量避免弹簧圈危急事件的发生,选择大小合适的弹簧圈,长度可以略短一些,第 1 枚弹簧圈和最后 1 枚弹簧圈至关重要,尤其是支架辅助弹簧圈栓塞时,弹簧圈与支架金属丝

间的摩擦阻力导致弹簧圈解旋拉伸,减少弹簧圈反复进出动脉瘤,及时发现弹簧圈的解旋拉伸和移位,采取积极的血管内治疗技术处理弹簧圈危急事件,防患于未然。当然,术中足量的抗凝和术后及时的足量的联合抗血小板聚集治疗可以防止支架源性血栓事件和支架内再狭窄等风险。

[参考文献]

- [1] Molyneux A, Kerr R, Stratton I, et al. International Susbarachnoid Aneurysm Trial (ISAT) of neurosurgical clipping versus endovascular coiling in 2143 patients with ruptured intracranial aneurysms: a randomised trial[J]. *Lancet*, 2002, 360: 1267 - 1274.
- [2] Higashida RT, Lahue BJ, Torbey MT, et al. Treatment of unruptured intracranial aneurysms: a nationwide assessment of effectiveness[J]. *AJNR*, 2007, 28: 146 - 151.
- [3] Li MH, Gao BL, Fang C, et al. Angiographic follow-up of cerebral aneurysms treated with Guglielmi detachable coils: an analysis of 162 cases with 173 aneurysms[J]. *AJNR*, 2006, 27: 1107 - 1112.
- [4] Lee CY. Use of wire as a snare for endovascular retrieval of displaced or stretched coils: rescue from a technical complication[J]. *Neuroradiology*, 2010, Mar 30. [Epub ahead of print].
- [5] Derdeyn CP, Cross DT 3rd, Moran CJ, et al. Postprocedure ischemic events after treatment of intracranial aneurysms with Guglielmi detachable coils[J]. *J Neurosurg*, 2002, 96: 837 - 843.
- [6] Yoo E, Kim DJ, Kim DI, et al. Bailout stent deployment during coil embolization of intracranial aneurysms [J]. *AJNR*, 2009, 30: 1028 - 1034.
- [7] Dinc H, Kuzeyli K, Kosucu P, et al. Retrieval of prolapsed coils during endovascular treatment of cerebral aneurysms [J]. *Neuroradiology*, 2006, 48: 269 - 272.
- [8] Fiorella D, Albuquerque FC, Deshmukh VR, et al. Monorail snare technique for the recovery of stretched platinum coils: technical case report[J]. *Neurosurgery*, 2005, 57: E210.
- [9] Luo CB, Chang FC, Teng MM, et al. Stent management of coil herniation in embolization of internal carotid aneurysms [J]. *AJNR*, 2008, 29: 1951 - 1955.
- [10] Sugi K, Martin J, Jean B, et al. Rescue balloon procedure for an emergency situation during coil embolization for cerebral aneurysms Technical note[J]. *J Neurosurg*, 2002, 96: 373 - 376.
- [11] Fressler RD, Ringer AJ, Qureshi AI, et al. Intracranial stent placement to trap an extruded coil during endovascular aneurysm treatment: technical note[J]. *Neurosurgery*, 2000, 46: 248 - 253.
- [12] Lavine SD, Larsen DW, Giannotta SL, et al. Parent vessel Guglielmi detachable coil herniation during wide-necked aneurysm embolization: treatment with intracranial stent placement: two technical case reports[J]. *Neurosurgery*, 2000, 46: 1013 - 1017.
- [13] Schutz A, Solymosi L, Vince GH, et al. Proximal stent fixation of fractured coils: technical note[J]. *Neuroradiology*, 2005, 47: 874 - 878.
- [14] Kim YB, Lee KC, Lee JW, et al. Rescue microsurgery in coil herniation causing thromboembolic occlusion of parent artery[J]. *Acta Neurochir*, 2009, 151: 1609 - 1616.
- [15] Chen Z, Tang W, Feng H, et al. Surgical extraction of migrated coils via proximal segment of the anterior cerebral artery: an emergency alternative[J]. *Neurol India*, 2009, 57: 327 - 330.
- [16] Gao BL, Li MH, Wang YL, et al. Delayed coil migration from a small wide-necked aneurysm after stent-assisted embolization: case report and literature review[J]. *Neuroradiology*, 2006, 48: 333 - 337.
- [17] 王武, 李明华, 杜倬雯, 等. Neuroform3 支架在急诊血管内栓塞破裂性颅内宽颈动脉瘤中的应用[J]. *介入放射学杂志*, 2009, 18: 4 - 10.
- [18] Park HK, Horowitz M, Jungreis C, et al. Periprocedural morbidity and mortality associated with endovascular treatment of intracranial aneurysms[J]. *AJNR*, 2005, 26: 506 - 514.
- [19] Meguro T, Sasaki T, Haruma J, et al. Arterial stenosis after coil migration in embolization of an aneurysm[J]. *No Shinkei Geka*, 2010, 38: 41 - 45.
- [20] Henkes H, Lowens S, Preiss H, et al. A new device for endovascular coil retrieval from intracranial vessels: alligator retrieval device[J]. *AJNR*, 2006, 27: 327 - 329.
- [21] Sedat J, Chau Y, Mondot L, et al. Endovascular occlusion of intracranial wide-necked aneurysms with stenting (Neuroform) and coiling: mid-term and long-term results[J]. *Neuroradiology*, 2009, 51: 401 - 409.
- [22] Biondi A, Janardhan V, Katz JM, et al. Neuroform stent-assisted coil embolization of wide-neck intracranial aneurysms: strategies in stent deployment and midterm follow-up [J]. *Neurosurgery*, 2007, 61: 460 - 469.

(收稿日期:2010-09-15)