·神经介入治疗临床研究·

# 双微导管技术栓塞复杂颅内动脉瘤

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【摘要】 **研究背景**　尽管球囊或支架辅助栓塞技术已在临床广泛应用，但是对于结构复杂的颅内动脉瘤如相对宽颈的微小动脉瘤或宽颈分叶状、有重要分支血管自瘤颈部或体部发出的动脉瘤，微弹簧圈栓塞治疗仍是一种挑战。本研究旨在评价双微导管技术栓塞结构复杂颅内动脉瘤的可行性和临床疗效。**方法与结果**　33例复杂颅内动脉瘤位于前交通动脉（7例）、后交通动脉（14例）、眼动脉段（3例）、脉络膜前动脉（3例）、小脑后下动脉起始部（3例）、大脑中动脉分叉部（2例）和基底动脉顶端（1例）。动脉瘤颈宽/体宽平均为0.80±0.21（0.53～1.33）、体宽/高度为1.12±0.37（0.55～2.12）和高度/颈宽为1.26±0.41（0.65～2.96）；瘤颈直径≥4 mm者7例、颈宽≥高度者9例、颈宽≥体宽者8例；微小动脉瘤（最大径≤3 mm）9例，有重要分支血管自瘤颈发出者13例。均采用双微导管技术施行微弹簧圈栓塞治疗，并且获得成功，其中动脉瘤致密填塞19例、瘤颈残留14例，术后脑血管造影检查12例弹簧圈襻突出于瘤颈之外，但均不影响血流。出院时改良Rankin量表评分2分者3例、0～1分者30例；仅1例患者术后1年行脑血管造影检查显示瘤颈微弹簧圈少许压缩，且动脉瘤瘤颈呈“狗耳朵”样再通显影。**结论**　双微导管技术栓塞颅内复杂动脉瘤可行、安全、有效。

【关键词】 颅内动脉瘤；　双微导管（非*MeSH*词）；　栓塞，治疗性

## Double microcatheter technique for coiling intracranial aneurysms with unfavorable configurations

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【**Abstract**】 **Background**　Although stent-assisted technique has been widely used clinically, it is still hard to perform coiling treatment for complicated intracranial aneurysms, including relatively wide-necked tiny aneurysms and lobulated wide-necked aneurysms with important branch vessels arising from the neck. This study aims to investigate the feasibility and clinical results of endovascular treatment for intracranial aneurysms with unfavorable configurations by using double microcatheter technique. **Methods**　Thirty-three cases with complicated aneurysms were treated by using double microcatheter technique from April 2008 to November 2012. The locations of these aneurysms were anterior communicating artery (7 cases), posterior communicating artery (14 cases), ophthalmic artery (3 cases), anterior choroidal artery (3 cases), origin of posterior inferior cerebellar artery (3 cases), bifurcation of middle cerebral artery (2 cases) and top of basilar artery (1 case). The mean neck-to-body (width) ratio was 0.80±0.21 (0.53–1.33). The mean body (width)-to-dome (height) ratio was 1.12±0.37 (0.55–2.12). The mean dome (height)-to-neck ratio was 1.26±0.41 (0.65–2.96). The diameter of neck ≥4 mm was seen in 7 aneurysms, neck ≥ height in 9 and neck ≥ width in 8. Besides, there were 9 very small aneurysms (the maximum diameter ≤3 mm) and 13 aneurysms with important branch vessels arising from the neck. All of these aneurysms were treated with coiling by using double microcatheter technique. **Results**　All aneurysms were successfully embolized. Immediate postembolization angiography showed no residual contrast filling in 19 aneurysms, and residual filling in 14. There were some small loops protruding from the neck without influencing the blood flow in 12 cases. At discharge, according to modified Rankin Scale (mRS), 30 patients with 0–1 scores presented excellent clinical outcomes and 3 patients with 2 scores had cognitive dysfunction and moderate disability due to vasospasm. Among the 33 cases, only 1 case receiving follow-up angiography 1 year after operation showed the coils near the neck were slightly compressed and

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presented a "dog ear" like recanalization. **Conclusion** According to the clinical experience with complicated aneurysms, double microcatheter technique is feasible, safe and effective for coil embolization of aneurysms with unfavorable configurations.

**【Key words】** Intracranial aneurysm; Dual microcatheter (not in *MeSH*); Embolization, therapeutic

可解脱式弹簧圈栓塞术治疗颅内动脉瘤已有20余年的历史，特别是球囊和支架辅助技术与材料的进步，使大多数颅内动脉瘤均可采用弹簧圈栓塞治疗。然而，对于某些形态及结构复杂的动脉瘤，例如有重要分支血管自瘤颈或瘤体发出的动脉瘤、宽颈或相对宽颈的微小动脉瘤，使用可解脱式弹簧圈栓塞治疗则有一定难度和危险[1]。颅内动脉瘤栓塞技术最重要的环节是弹簧圈在瘤腔内的成“篮”效果和稳定程度，对于宽颈或相对宽颈的分叶状颅内动脉瘤或微小动脉瘤，如果弹簧圈在动脉瘤内分布不均匀或成“篮”不稳定，则在后续的填塞过程中有可能发生弹簧圈移位、突出甚至脱出的危险。覆膜支架是治疗复杂颅内动脉瘤的一种好方法，但只能用于载瘤动脉节段内无分支血管的动脉瘤，适应证较窄[2]。双微导管技术是以头端弯曲角度略有不同的两支微导管插入动脉瘤，使术者有机会在动脉瘤内先后或同时操控两枚弹簧圈，达到既适宜动脉瘤形状使弹簧圈分布均匀又能稳定成“篮”效果。此项技术是Baxter等[3]在1998年首次报告，笔者根据其方法采用双微导管技术共栓塞治疗33例颅内动脉瘤患者，临床效果满意，报告如下。

## 资料与方法

一、一般资料

选择2008年4月–2012年11月在天津市环湖医院神经外科住院治疗且经数字减影血管造影术（DSA）明确诊断的颅内动脉瘤患者共计33例，男性11例，女性22例；年龄42～81岁，平均（57.55±11.56）岁。其中2例为未破裂动脉瘤，其余31例均为动脉瘤性蛛网膜下隙出血（SAH），自发病至脑血管造影动脉瘤栓塞时间为6～120 h，平均（42.71±51.07）h。入院时Hunt-Hess分级Ⅰ级者9例、Ⅱ级14例、Ⅲ级7例、Ⅳ级1例。本组患者动脉瘤分别位于前交通动脉段（7例）、后交通动脉段（14例）、眼动脉段（3例）、脉络膜前动脉段（3例）、小脑后下动脉起始部（3例）、大脑中动脉分叉部（2例）和基底动脉顶端（1例）。

二、诊断与治疗方法

1. 手术设备 采用美国GE公司生产的单“C”形臂GE Innova 3100IQ或德国Siemens公司生产的Syngo AXION Artis FA VB11D数字减影仪进行脑血管造影和动脉瘤栓塞，并于三维计算机工作站重建影像测量动脉瘤直径，分别记录每例动脉瘤之颈宽、体宽和高度3个数据。

2. 手术适应证 宽颈动脉瘤被定义为颈宽≥体宽；相对宽颈动脉瘤为颈宽≥4 mm或颈宽/体宽≥0.80或高度/颈宽≤1[4]。本组颅内动脉瘤患者，瘤颈直径1.80～5.90 mm、平均（3.27±1.04）mm，体宽2.10～11.80 mm、平均（4.41±2.14）mm，高度1.60～9.70 mm、平均（4.13±1.81）mm；动脉瘤颈宽/体宽0.53～1.33、平均0.80±0.21，体宽/高度0.55～2.12、平均1.12±0.37，高度/颈宽为0.65～2.96、平均1.26±0.41。动脉瘤瘤颈直径≥4 mm者7例，颈宽≥高度者9例，颈宽≥体宽者8例；微小动脉瘤（最大直径≤3 mm）患者9例；有重要分支血管自瘤颈部发出者13例。

3. 手术方法 患者仰卧位，于气管插管全身麻醉下经右侧股动脉穿刺置入6F导管鞘，全身肝素化后6F导引导管连接双“Y”阀（图1），并导入至载瘤动脉颅底段，根据三维数字减影血管造影（3D-DSA）工作站重建图像，选择观察瘤颈最佳工作角度，导入一根微导管进入动脉瘤内并推入首枚弹簧圈，若弹簧圈在动脉瘤内分布不均匀、成“篮”不满意或术者认为弹簧圈欠稳定，可暂不解脱；再导入第2根微导管进入动脉瘤，其头端塑形的角度与第1根略有不同，然后推入第2枚弹簧圈，使其与第1枚弹簧圈互相推挤、缠绕，在此过程中若第1枚弹簧圈发生移位向外突出，则可择机将两枚弹簧圈后拉，先后或同时操控2枚弹簧圈使之成“篮”满意并稳定，然后解脱其中之一，推入第3枚弹簧圈，如此交替解脱、顺序推入弹簧圈，直至达到致密填塞并保持载瘤动脉和瘤颈重要分支血管血流通畅。为了避免混淆两支微导管的顺序，手术过程中可采用无菌巾折叠覆盖其中一支，使每次推送和解脱弹簧圈时术野中

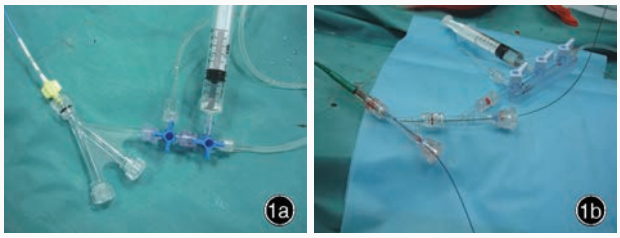

**图1**　颅内动脉瘤弹簧圈栓塞术双微导管技术的应用　1a　6F导引导管接双"Y"阀　1b　6F导引导管接两个"Y"阀

**Figure 1**　The application of double microcatheter technique in the coiling treatment for intracranial aneurysms. A 6F guiding catheter connecting with a double rotating hemostatic valve Y-connector (Panel 1a). A 6F guiding catheter connecting with two conventional hemostasis valve connected in linear type (Panel 1b).

仅显露其中一支微导管。动脉瘤栓塞效果分为两种情况，即动脉瘤完全栓塞和瘤颈残留。以手术终末造影所显示的弹簧圈致密、动脉瘤完全不显影为动脉瘤完全栓塞；以动脉瘤体部不显影，但瘤颈处弹簧圈欠致密、瘤颈处有"狗耳朵"样显影为瘤颈残留。上述两种情况均为栓塞成功。

## 结　果

一、临床疗效评价

本组33例患者中3例因蛛网膜下隙出血后脑血管痉挛而出现轻度认知功能障碍和轻度神经功能障碍，出院时根据改良Rankin量表（mRS）评分为2分；其余30例出院时mRS评分为0～1分。

二、神经影像学疗效评价

本组患者经弹簧圈栓塞治疗达到动脉瘤致密填塞者19例，瘤颈残留者14例；微小弹簧圈襻突出于瘤颈之外者12例，但未影响载瘤动脉和瘤颈部分支血管（图2）。1例后交通动脉动脉瘤术中破裂患者，瘤颈宽6.40 mm、体宽11.80 mm、高度7.20 mm，呈三叶状，大脑后动脉自瘤颈部发出，第9枚弹簧圈（4 mm×120 mm）经多次调整位置仍未能完全推入，完全拉回后患者出现血压升高、心率加速等应激反应，立即予以鱼精蛋白50 mg中和肝素，降血压，并迅速再度推入2枚较小的弹簧圈（3 mm×80 mm和2 mm×40 mm），载瘤动脉造影显示动脉瘤体部填塞满意，无对比剂外溢，瘤颈处弹簧圈欠致密，瘤颈处部分显影，术中脑血管造影类CT重建显示蛛网膜下隙出血增多（图3），患者术后出现严重头痛症状，通过脑室外引流后症状明显改善。本组33例患者中15例因手术过程中成"篮"效果欠佳而采用双微导管，其中8例为相对宽颈动脉瘤，首枚弹簧圈虽成"篮"效果较满意但欠稳定，遂应用第2支微导管；7例微小动脉瘤患者，由于首枚弹簧圈成"篮"困难，推入弹簧圈后微导管被顶出，故应用第2支微导管。其余18例均为手术前既定采用双微导管技术。本组33例患者中有6例在推入第2枚弹簧圈时造成首枚弹簧圈移位，因此需将成"篮"效果不满意的2枚弹簧圈都重新拉回调整位置（图4）。本组有1例椎动脉宽颈动脉瘤患者术后1年接受脑血管造影复查时，显示弹簧圈压缩，瘤颈呈极细小的再通显影（图5）；其余32例术后未满1年或拒绝接受脑血管造影复查。

## 讨　论

双微导管技术与球囊或支架辅助技术比较，略有不同。第一，球囊或支架辅助技术比较复杂，需要术者经过特殊训练并具备更多临床经验；球囊阻断血流可使脑组织短暂性缺血，球囊扩张时易损伤血管内皮并可使微导管移位和固定，从而限制了在推送弹簧圈过程中微导管的摆动，有穿破动脉瘤的危险。支架在血管内属异物，急症手术前需大剂量服用和术后长期服用抗血小板药物，预防支架引起的急性或慢性血小板聚集，即便如此，仍有可能发生急性血栓形成或刺激血管内皮增生造成血管狭窄。另外，对于蛛网膜下隙出血量较大的患者引流血性脑脊液为重要治疗手段之一，而抗血小板和抗凝治疗对腰椎穿刺、腰大池或脑室外引流等有创治疗亦有一定影响；如果动脉瘤栓塞不成功，尚需即刻改行开颅手术，这些均存在增加出血导致严重并发症的潜在危险。球囊和支架在细小、迂曲的血管内使用难度较大，很难保护动脉瘤瘤颈或体部发出的重要分支血管[5-6]。双微导管技术使用的器械材料与常规弹簧圈栓塞动脉瘤无区别，其优点为：操作无特殊技术要求；术中无需阻断血流，术者操作从容；血管内不存留异物；术后无需服用抗血小板药物。两支1.7F型微导管的直径相加为1.13 mm，6F导引导管的内径为1.80 mm，因此两支微导管在6F导引导管中进行操作不会相互干扰，与单微导管操作并无区别，唯一不同点是在6F导引导管尾端连接双"Y"阀。两支1.7F微导管所占横截面积约为0.50 $mm^2$，而6F导引导管横截面积为2.54 $mm^2$，剩余管腔不小于5F造影管的管腔（1.13 $mm^2$），不影响路径图（road map）和脑血管造影，因此双微导管技术


**图2** 全脑血管造影所见为相对宽颈微小动脉瘤，脉络膜前动脉自瘤颈部发出 2a 首枚弹簧圈位置良好但欠稳定，故采用双微导管技术 2b 反复调整两枚未解脱弹簧圈位置，使脉络膜前动脉开口处不受影响 2c 少许弹簧圈襻突入颈内动脉，动脉瘤未显影，脉络膜前动脉血流通畅 **图3** 全脑血管造影显示相对宽颈分叶状颅内动脉瘤 3a 两枚10 mm×300 mm填充弹簧圈成"篮"效果满意 3b 共填塞11枚弹簧圈，瘤颈处弹簧圈欠致密 3c 术后CT检查显示蛛网膜下隙出血略有增加

**Figure 2** Digital subtraction angiography (DSA) showed relatively wide-necked tiny aneurysm and anterior choroidal artery (AchA) arose from the neck of the aneurysm. The position of the first coil was good but not stable, so double microcatheter technique was used (Panel 2a). The two undetached coils were repeatedly manipulated to reach a coil mass not interrupting the orifice of AchA (Panel 2b). Small loops of the coils extruded without compromising the parent vessel and the AchA was unobstructed (Panel 2c). **Figure 3** DSA showed relatively wide-necked lobulated aneurysm. A stable "basket" was formed by two coils with the same size of 10 mm × 300 mm (Panel 3a). A total of 11 coils were inserted into the aneurysm, and the coil mass did not fill the neck completely (Panel 3b). CT imaging after operation showed the subarachnoid hemorrhage (SAH) aggravated slightly (Panel 3c).

不增加与手术器械相关的危险[7]。第二，双微导管技术尚可用于远端甚至迂曲的小血管，只要靶血管管腔能够容纳两支微导管即可。第三，双微导管技术仅增加一支微导管的费用，显著低于球囊或支架辅助技术所需费用。

双微导管技术操作的关键步骤是通过操控两枚弹簧圈在动脉瘤内编织一个既不影响载瘤动脉亦不影响瘤颈重要分支血管的稳定"篮筐"。因此，微导管头端塑形，以及弹簧圈大小、形状的选择即显得尤为重要。笔者对本组病例的治疗体会是，两支微导管头端塑形角度略有不同，可以进入动脉瘤内的不同位置，推入弹簧圈盘绕的方向和形态也会略有不同。弹簧圈的选择是根据术中具体情况决定的，一般选择两枚不同的弹簧圈，例如，首枚选用三维形状的弹簧圈，第2枚即可选择填充式弹簧圈，或选择两枚直径不同的三维或填充式弹簧圈等。而更多的情况是在第1枚弹簧圈完全推入后，根据操控第1枚弹簧圈的体会，依需要选择第2枚弹簧圈。偶尔亦可使用同时操控两枚弹簧圈配合的成"篮"技术，但要注意两枚弹簧圈同时反复的推拉调整可能会互相缠绕成结，甚至造成弹簧圈解旋拉直不能推入[8]。

当弹簧圈稳定成"篮"后，先解脱哪一枚弹簧圈较难决定，笔者的体会是，较稳定、导管位置较好的弹簧圈暂不解脱，先解脱另一枚并利用其微导管继续填塞。如果认为两枚弹簧圈的成"篮"效果仍不够稳定时，还可以经对侧股动脉再插入一或两支微导管，但本组病例未曾应用过3或4根微导管。根

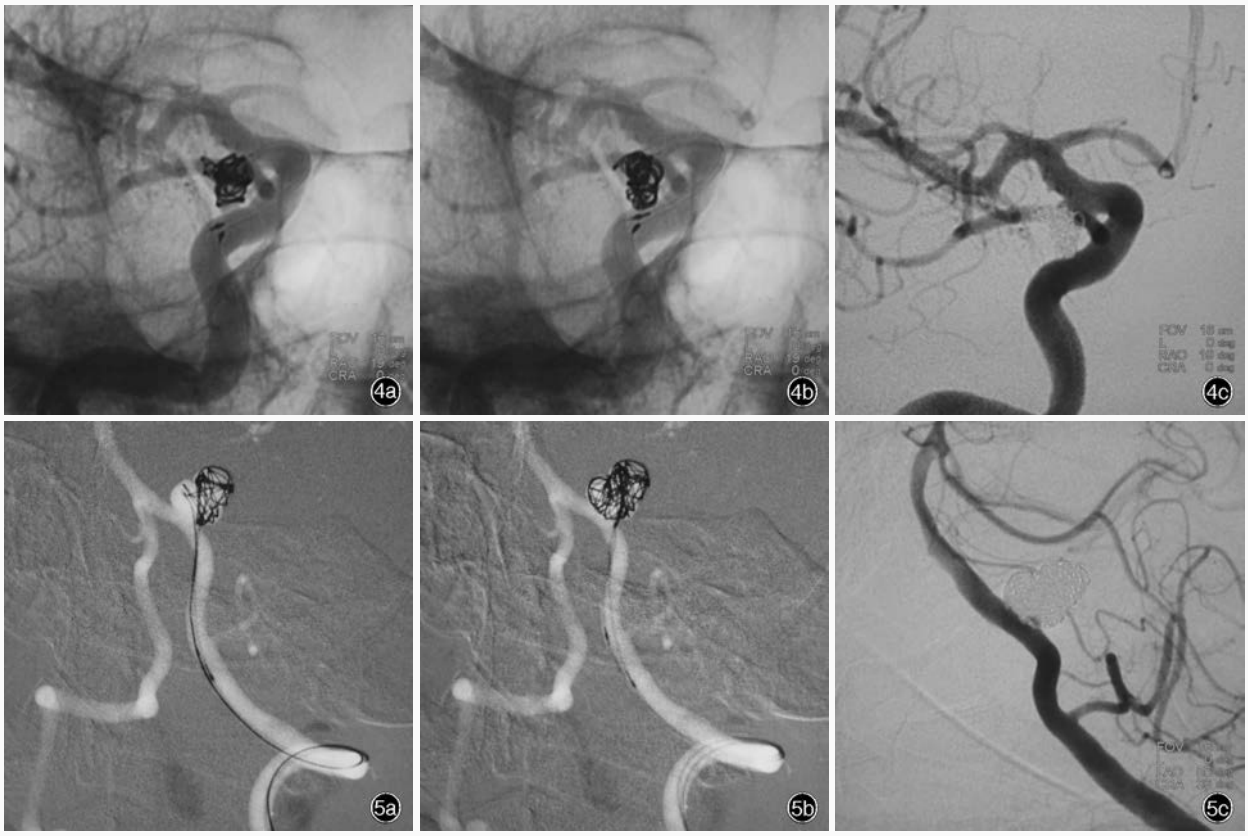

**图4**　全脑血管造影显示相对宽颈的靴形颅内动脉瘤，动脉瘤高度/颈宽为0.91，大脑后动脉自瘤颈部发出　4a　两枚尚未解脱的弹簧圈部分突出，影响大脑后动脉开口　4b　将两枚弹簧圈重新拉回调整位置，以保持大脑后动脉开口处血流通畅　4c　弹簧圈致密填塞过程中造成一个襻突出，但未影响大脑后动脉血流通畅　**图5**　全脑血管造影显示左侧椎动脉颅内段相对宽颈动脉瘤　5a　首枚弹簧圈为10 mm×300 mm盘绕于瘤顶部，第2支微导管进入动脉瘤瘤体下半部　5b　推入的第2枚弹簧圈为8 mm×200 mm在瘤体部，成"篮"效果满意，共9枚弹簧圈达到致密填塞　5c　术后1年脑血管造影显示，瘤颈部弹簧圈压缩，呈现少许再通迹象

**Figure 4**　DSA showed boot-shaped relatively wide-necked aneurysm. The dome (height)/neck ratio of the aneurysm was 0.91, and the posterior cerebral artery (PCA) arose from the neck of the aneurysm. Two undetached coils extruded partially, compromising the origin of PCA (Panel 4a). The two coils were pull back completely and were repeatedly manipulated so as not to interrupt the orifice of PCA (Panel 4b). When the aneurysm was densely packed, a coil loop extruded without compromising the parent artery (Panel 4c). **Figure 5**　DSA showed relatively wide-necked aneurysm located in the intracranial part of the left vertebral artery. The first coil with the size of 10 mm × 300 mm was deployed around the top of the aneurysm, and a second microcatheter was introduced into the lower part of the aneurysm (Panel 5a). The second coil with the size of 8 mm × 200 mm was pushed around the body part, forming a "basket". A total of 9 coils were inserted to acquire dense packing (Panel 5b). Follow-up DSA 1 year after treatment showed compression of the coil mass near the neck and slight recanalization (Panel 5c).

据对本组病例的总结分析，笔者认为，双微导管技术适用于以下几种情况：(1)相对宽颈的矮胖型或分叶状动脉瘤。此类动脉瘤由于瘤体宽径大于高度，若选用直径适合瘤体宽度的弹簧圈，则弹簧圈易自瘤颈部突出，若选择直径适宜瘤体高度的弹簧圈则不能均匀分布和稳定成"篮"。因此，可将动脉瘤假想为两个空腔，用两支微导管两枚弹簧圈分别在假想的两个腔内成"篮"并互相挤靠，从而达到弹簧圈既能均匀分布又能稳定成"篮"的效果。(2)有重要分支血管自相对宽颈的动脉瘤颈部发出。术者认为首枚弹簧圈在动脉瘤瘤腔内成"篮"不稳定，恐推入第2枚弹簧圈会导致首枚弹簧圈移位、突出甚至脱出时，可在不解脱弹簧圈的情况下，用第2支微导管推入第2枚弹簧圈，如果弹簧圈出现移位、突出或脱出而影响瘤颈部的分支血管时则有机会将弹簧圈拉回重新调整位置。(3)宽颈或相对宽颈的微小动脉瘤。此类动脉瘤瘤腔空间极小，当推入第2枚弹簧圈时有可能造成第1枚弹簧圈移位、突出或脱出。此时，可利用两支微导管同时推送两枚弹簧圈进行动脉瘤致密填塞。(4)高凝状态的相对宽颈动脉瘤。对于实验室检测呈现高纤维蛋白原、高血糖、高血脂，以及动脉粥样硬化伴多发性脑血管狭窄的宽颈动脉瘤患者，若因急症动脉瘤栓塞手术时无法充足准备双抗血小板，或因费用问题拒绝或不

能采用支架辅助栓塞治疗时，可采用双微导管技术。(5)相对宽颈的细长形动脉瘤。动脉瘤体高为体宽的两倍，颈宽与体宽几乎相等，为了使弹簧圈成“篮”为“8”字形，大多选择直径较体宽稍大的弹簧圈，这种弹簧圈成“篮”后微导管易被推出动脉瘤瘤腔。此时为保证微导管能再进入，可以选择另一支微导管先进入动脉瘤瘤腔，再用弹簧圈“8”字成“篮”，然后利用另一支微导管自内向外在第1枚弹簧圈的“篮筐”内逐步致密填塞。

双微导管技术栓塞颅内复杂动脉瘤仅需掌握常规操作技术，不增加手术风险，更重要的是可以保护自动脉瘤瘤颈发出的重要分支血管，与球囊、支架相比增加的手术费用不多。虽然采用双微导管技术栓塞颅内动脉瘤具有许多优势，但并非万能，病例选择也应严格掌握手术适应证。从操作技术和术中、术后并发症方面考虑，双微导管技术是安全有效的。

## 参 考 文 献


[1] Kwon OK, Kim SH, Kwon BJ, Kang HS, Kim JH, Oh CW, Han MH. Endovascular treatment of wide-necked aneurysms by using two microcatheters: techniques and outcomes in 25 patients. AJNR Am J Neuroradiol, 2005, 26:894-900.

[2] Yin L, Fan YM, Xu X, Huang Y. Endovascular treatment of intracranial aneurysms with covered stents (with report of 9 cases). Zhongguo Xian Dai Shen Jing Ji Bing Za Zhi, 2011, 11:209-215.[尹龙, 范一木, 徐翔, 黄楹. 覆膜支架血管内治疗颅内动脉瘤：附九例报告. 中国现代神经疾病杂志, 2011, 11:209-215.]

[3] Baxter BW, Rosso D, Lownie SP. Double microcatheter technique for detachable coil treatment of large, wide-necked intracranial aneurysms. AJNR Am J Neuroradiol, 1998, 19:1176-1178.

[4] Li J, Liu L, Li MQ. Clinical evaluation of therapeutic measures for intracranial aneurysms. Zhongguo Xian Dai Shen Jing Ji Bing Za Zhi, 2012, 12:5-10.[李娟, 刘凌, 李梦秋. 颅内动脉瘤治理措施的临床证据评价. 中国现代神经疾病杂志, 2012, 12:5-10.]

[5] Levy DI, Ku A. Balloon-assisted coil placement in wide-necked aneurysms: technical note. J Neurosurg, 1997, 86:724-727.

[6] Lanzino G, Wakhloo AK, Fessler RD, Hartney ML, Guterman LR, Hopkins LN. Efficacy and current limitations of intravascular stents for intracranial internal carotid, vertebral, and basilar artery aneurysms. J Neurosurg, 1999, 91:538-546.

[7] Kai Y, Ohmori Y, Watanabe M, Kaku Y, Morioka M, Hirano T, Yano S, Kawano T, Hamada J, Kuratsu J. A 6-Fr guiding catheter (Slim Guide(®)) for use with multiple microdevices. Surg Neurol Int, 2012, 3:59.

[8] Shin YS, Kim DI, Lee SI, Chung JI, Yoon PH, Lee KC. The usefulness of the new "double-catheter technique" in the treatment of parent artery incorporated wide-necked aneurysm with guglielmi detachable coils: technical notes. Interv Neuroradiol, 2000, 6:61-64.


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## 21st World Congress of Neurology

The 21st World Congress of Neurology will take place in September 21–26, 2013 in Vienna, Austria. The congress theme is "Neurology in the Age of Globalization", and it will discuss the major breakthroughs and developments in the field of neurology: from clinical practice to research and technology. In addition to a top-rate scientific program, there will be many opportunities for hands-on learning and networking as well as exciting social events. Major topics on the congress include: epilepsy, movement disorders, stroke, neuro-critical care, dementia, multiple sclerosis & demyelinating diseases, neuromuscular disorders, headache, pain and neurorehabilitation.

Time: September 21–26, 2013

Address: Vienna, Austria

Email: wcn@kenes.com

Website: www2.kenes.com/wcn/Pages/Home.aspx

## 14th International Neurotoxicology Association Meeting

The theme of the meeting is "Neurodevelopmental Basis of Health and Disease" and will mainly talk about developmental neurotoxicity, alternative methods and animal 3Rs, neuroendocrine toxicity, metabolic syndrome and CNS diseases, new (in vivo) approaches in neuropathology, translational neurotoxicology and neurotoxicity of nanoparticles.

Chairman: Prof.Dr. Jordi Llorens

Time: June 9–13, 2013

Venue: Egmond aan Zee, the Netherlands

Email: INA@bastiaanse-communication.com

Website: www.ina14.org