·慢性大血管闭塞开通·

症状性非急性颅内动脉闭塞血管再通治疗探讨

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【摘要】 **目的** 初步探讨症状性非急性颅内动脉闭塞血管再通治疗的可行性、有效性和安全性。**方法** 纳入2008年12月至2019年8月接受血管再通治疗的61例症状性非急性颅内动脉闭塞病例，脑梗死溶栓血流分级（TICI）评价血管再通率、记录围手术期并发症，改良Rankin量表（mRS）评价预后、DSA观察动脉再狭窄率。**结果** 53例（86.89%）血管再通成功、8例（13.11%）血管再通失败，4例微导丝无法通过闭塞段而放弃手术、1例微导丝刺破穿支动脉致破裂出血死亡、3例术后脑高灌注综合征致颅内出血死亡。53例术后临床症状均明显改善，随访6～24个月，预后良好44例、预后中等6例、预后不良3例；4例发生动脉再狭窄，但均无临床症状。**结论** 症状性非急性颅内动脉闭塞的血管再通治疗在技术上可行，且疗效肯定，远期预后良好，但神经介入技术要求较高，术者需具备一定的技术储备和临床经验，以及围手术期管理能力和并发症处理能力，同时需要良好的治疗团队与护理团队精诚合作。

【关键词】 动脉闭塞性疾病； 颅内动脉疾病； 血管成形术； 手术中并发症； 预后

Investigation of endovascular recanalization for symptomatic non-acute intracranial artery occlusion

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【**Abstract**】 **Objective** To explore the feasibility, effectiveness and safety of endovascular recanalization of symptomatic non-acute intracranial artery occlusion (SNIATO). **Methods** Sixty-one patients with SNIATO from December 2008 to August 2019 were enrolled. All patients underwent endovascular recanalization. Thrombolysis Cerebral Infarction (TICI) was used to evaluate the recanalization rate and record perioperative complications. For complications during surgery, the prognosis was evaluated by modified Rankin Scale (mRS). The arterial restenosis was observed by DSA. **Results** Fifty-three (86.89%) of 61 patients had successful recanalization, while 8 (13.11%) had failed recanalization. Among the 8 patients, 4 cases failed to pass through the occluded segment with the microwire gave up the operation, one patient died of branch artery bleeding caused by puncture of microwire and was ruptured, and 3 cases died of intracranial hemorrhage (ICH) caused by postoperative cerebral hyperperfusion syndrome (CHS). Fifty-three patients with successful recanalization had improved postoperative clinical symptoms and completed 6–24 months for follow-up. Forty-four patients had a good prognosis, 6 had a moderate prognosis, and 3 had a poor prognosis. Arterial restenosis occurred in 4 patients with no clinical symptoms. **Conclusions** Endovascular recanalization for SNIATO is technically feasible, and the efficacy is positive. The long-term prognosis is good, but the requirements for neurointerventional technology are high. The surgeon must have some technical reserve and clinical experience. During the perioperative period, the doctor must have the ability to manage and treat the complications to cooperate between the treatment team and the nursing team.

【**Key words**】 Arterial occlusive diseases; Intracranial arterial diseases; Angioplasty; Intraoperative complications; Prognosis
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脑卒中具有高病死率、高病残率和高复发率特点，已从1990年国人第3位死因攀升至2017年的首位[1]，其中缺血性卒中约占70%，动脉粥样硬化是最常见的病因[2-3]。颅内动脉粥样硬化性狭窄或闭塞致缺血性卒中统称为颅内大血管闭塞性疾病，约占缺血性卒中的10%，其脑卒中年复发率为3.6%～22.0%[2-3]。发病超过24小时的颅内大血管闭塞称非急性颅内动脉闭塞（NIATO），亦称亚急性颅内动脉闭塞（SIATO）或慢性颅内动脉闭塞（CIATO）[4]。非急性颅内动脉闭塞患者在发病早期可因侧支代偿良好而无症状，但至后期由于部分侧支代偿不充分，逐渐进展为症状性非急性颅内动脉闭塞（SNIATO），临床以反复短暂性脑缺血发作（TIA）或缺血性卒中、症状进行性恶化、认知功能和情感障碍等为主要表现，脑卒中年复发风险达23.4%[4-6]，病残率和病死率较高，神经功能预后较差，存在血流动力学障碍者年复发风险更高，且缺血性卒中复发严重程度、范围与缺血半暗带区范围相一致[7-9]。有文献报道，亚裔人群短暂性脑缺血发作/缺血性卒中主要由颅内大血管狭窄或闭塞所致[10-11]，中国颅内动脉粥样硬化研究（CICAS）亦显示，颅内动脉闭塞性疾病比例在中国人群中更高[12]。因此，应重视非急性颅内动脉闭塞特别是症状性非急性颅内动脉闭塞，探索技术可行和安全有效的治疗方法。血管再通治疗由于尚无统一的患者纳入标准且手术自身有一定风险，若围手术期管理不当可能出现术后过度灌注甚至颅内出血等致死性并发症，手术疗效尚不确定。但是，近年随着介入材料和介入技术的不断改进，部分非急性颅内动脉闭塞患者可以成功开通血管而获得良好疗效[13-16]。本研究对天津市第一中心医院近10余年接受血管再通治疗的61例症状性非急性颅内动脉闭塞患者的临床资料进行回顾分析，初步探讨血管再通治疗症状性非急性颅内动脉闭塞的风险评估、适应证、方法和围手术期管理等。

资料与方法

一、临床资料

1. 纳入标准 （1）CTP或PWI显示闭塞动脉供血区低灌注与脑缺血症状相符，并经DSA证实相应颅内大血管闭塞。（2）磁共振血管壁成像（VWI）显示责任血管局限性闭塞，且闭塞时间＞24 h。（3）闭塞原因为大动脉粥样硬化。（4）内科保守治疗效果欠佳。（5）术前改良Rankin量表（mRS）评分≤3分。（6）所有患者及其家属对手术方案和治疗风险知情并签署知情同意书。

2. 排除标准 （1）心源性栓塞、小动脉闭塞等疾病导致的颅内血管闭塞。（2）术前mRS评分＞3分。（3）围手术期药物（如麻醉药、阿司匹林、氯吡格雷、低分子量肝素等）过敏。

3. 一般资料 选择2008年12月至2019年8月在我院神经外科行血管再通治疗的症状性非急性颅内动脉闭塞患者共61例，男性40例，女性21例；年龄45～78岁，中位年龄65岁；发病至入院时间1.00～3.50个月，中位时间2个月。既往有高血压41例（67.21%）、冠心病10例（16.39%）、糖尿病8例（13.11%）、高脂血症16例（26.23%），吸烟38例（62.30%）、酗酒6例（9.84%）；临床主要表现为记忆力减退58例（95.08%）、头晕41例（67.21%）、构音障碍15例（24.59%）、偏身麻木10例（16.39%）、共济失调8例（13.11%），视物模糊和复视6例（9.84%），以及偏瘫5例（8.20%）；入院时美国国立卫生研究院卒中量表（NIHSS）评分1～8分，中位评分5分；术前mRS评分1～3分，中位评分2分。所有患者均经规范内科保守治疗仍反复发生缺血性卒中或缺血性卒中进展，术前DWI显示存在新发梗死灶；PWI显示不同程度脑低灌注；闭塞部位分别位于大脑中动脉水平段23例（37.70%）、颈内动脉床突上段16例（26.23%）、椎-基底动脉交界区12例（19.67%），优势侧或双侧椎动脉颅内段10例（16.39%）；TICI分级均为0级。

二、研究方法

1. 血管再通治疗 患者平卧位，气管插管全身麻醉后经右侧股动脉置入6F股动脉鞘和6F导引导管，以微导丝（Transcend 205，美国Stryker公司）配合微导管（Echelon-10，美国EV3公司）通过闭塞段，将微导管置于闭塞血管远端，回撤微导丝，经微导管造影证实微导管进入闭塞段真腔。将交换微导丝（Transcend 300，美国Stryker公司）通过微导管进入闭塞段远端，撤出微导管，沿交换微导丝置入尺寸适宜的Gateway球囊（美国Stryker公司）由远及近扩张闭塞血管，扩张后复查DSA，观察血管再通后病变形态。若椎动脉起始部呈Mori分型A型，直接植入Apollo球囊扩张式支架[上海微创医疗器械（集团）有限公司]；若病变迂曲或较长，植入Wingspan支架（美国Stryker公司）；若病变长度＞20 mm，植入

Enterprise自膨式颅内动脉支架(美国Cordis公司)或由远及近植入多枚支架,支架释放后复查DSA,观察残留狭窄率和前向血流,结束手术。

2.围手术期处理 根据支架成形术和强化药物治疗预防颅内动脉狭窄患者脑卒中复发研究(SAMMPRIS)[17]和《中国急性缺血性脑卒中诊治指南2010》[18],术前常规服用阿司匹林100 mg/d和氯吡格雷75 mg/d,至少连续治疗3 d;术前2 h静脉泵入尼莫地平1 ml/h;肝肾功能正常者术前加用阿托伐他汀20 mg/晚。术后即刻经头部CT排除颅内出血后,皮下注射低分子肝素5000 U/次(3次/d),连续治疗3 d。术后平稳复苏,可适当延长镇痛药至术后72 h,顺利度过正常灌注压突破的高风险期,避免因过早拔管引起的呼吸道不通畅而致缺氧,以及过晚拔管引起的气管插管不耐受和不适感而致血压剧烈波动,进而诱发颅内出血。术后严格控制收缩压在100~120 mm Hg(1 mm Hg=0.133 kPa)以减少脑缺血-再灌注损伤,避免过度灌注导致的颅内出血,通常采取乌拉地尔100 mg溶于30 ml生理盐水中或尼卡地平10 mg溶于40 ml生理盐水中持续静脉泵入,血压监测时间间隔由5 min延长至30 min,待意识清醒且能服药时,加用硝苯地平(初始剂量5 mg)和厄贝沙坦氢氯噻嗪(初始剂量162.505 mg),逐步由静脉给药改为口服,血压监测时间间隔由30 min逐渐延长至6 h;继续服用阿司匹林100 mg/d联合氯吡格雷75 mg/d双联抗血小板治疗3个月,改为阿司匹林100 mg/d长期维持治疗。

3.观察指标 (1)血管再通:术后即刻复查DSA,残留狭窄率<20%且脑梗死溶栓血流分级(TICI)2b~3级,为血管再通成功。(2)围手术期并发症:包括穿支动脉破裂出血、颅内出血等。(3)预后:由两位神经外科医师分别于术前、出院时和随访期间(术后3、6、9和12个月)采用mRS量表对患者预后进行评价,mRS评分0~1分为预后良好、2~3分为预后中等、4~5分为预后不良。(4)动脉再狭窄:定期门诊或电话随访,术后6个月复查造影,观察有无动脉再狭窄。(5)生活方式:随访期间帮助患者戒烟限酒、控制体重、适量运动、健康饮食与作息,促其养成良好习惯,以降低缺血性卒中复发风险。

结 果

本组61例患者中53例血管再通成功,成功率为86.89%;8例(13.11%)血管再通失败,其中4例(6.56%)微导丝无法通过闭塞段而放弃手术、1例(1.64%)术中穿支动脉破裂出血而致死亡、3例(4.92%)因术后过度灌注引起颅内出血而死亡。除4例患者微导丝无法通过闭塞段外,其余57例患者中16例行单纯球囊扩张术,41例行球囊扩张术+支架植入术(植入1枚支架38例、植入2枚支架2例、植入3枚支架1例)。术后记忆力减退、头晕、偏身麻木、视物模糊和复视症状基本消失,构音障碍、共济失调、偏瘫症状不同程度缓解。

本组共有57例完成手术患者,出院时预后良好27例、预后中等23例、预后不良3例、死亡4例;其中53例血管再通成功患者完成6~24个月随访,平均18个月,术后6个月预后良好44例、预后中等6例、预后不良3例;其中43例门诊随访复查DSA,4例发生支架内再狭窄,TICI分级2a级3例、1级1例,但均无临床症状,未予处理。

典型病例

患者 男性,64岁。因头晕伴双下肢无力、吞咽障碍3周,于2019年2月13日入院。患者入院前3周无明显诱因出现头晕、双下肢无力、行走不稳,伴言语不清、饮水呛咳、吞咽困难,外院MRI显示双侧小脑半球、脑干多发急性梗死灶,MRA检查双侧椎-基底动脉闭塞,经内科保守治疗(具体方案不详)后症状未缓解。既往有缺血性卒中病史8月余,规律服用氯吡格雷、尼麦角林、倍他司汀、普罗布考、阿托伐他汀等药物,遗留言语不清后遗症;糖尿病病史4年,规律服用阿卡波糖、格列喹酮、二甲双胍等药物;冠心病病史10年,未规律诊治。入院后体格检查:言语不清,咽反射呈弱阳性,饮水呛咳,吞咽困难,双下肢肌力4级、肌张力正常,共济运动正常,左侧面部和肢体痛觉减退,双侧Babinski征可疑阳性,NIHSS评分2分。实验室检查:血清高密度脂蛋白胆固醇0.57 mmol/L(1.03~1.55 mmol/L),低密度脂蛋白胆固醇1.71 mmol/L(2.70~3.37 mmol/L),同型半胱氨酸21 μmol/L(0~15 μmol/L);尿糖强阳性,尿酮体阳性。血栓弹性描记图(TEG)显示,血液凝血因子活性、纤维蛋白原水平、血小板功能均于正常值范围,氯吡格雷对血小板抑制率为69.10%。心脏超声显示,室间隔增厚,左室射血分数(LVEF)56%。VWI显示,右椎动脉V4段、基底动脉起始部和右大脑后动脉闭塞,考虑急性血栓形成;左椎动脉V4段夹层伴壁内血肿;右颈内动脉起始部、右大

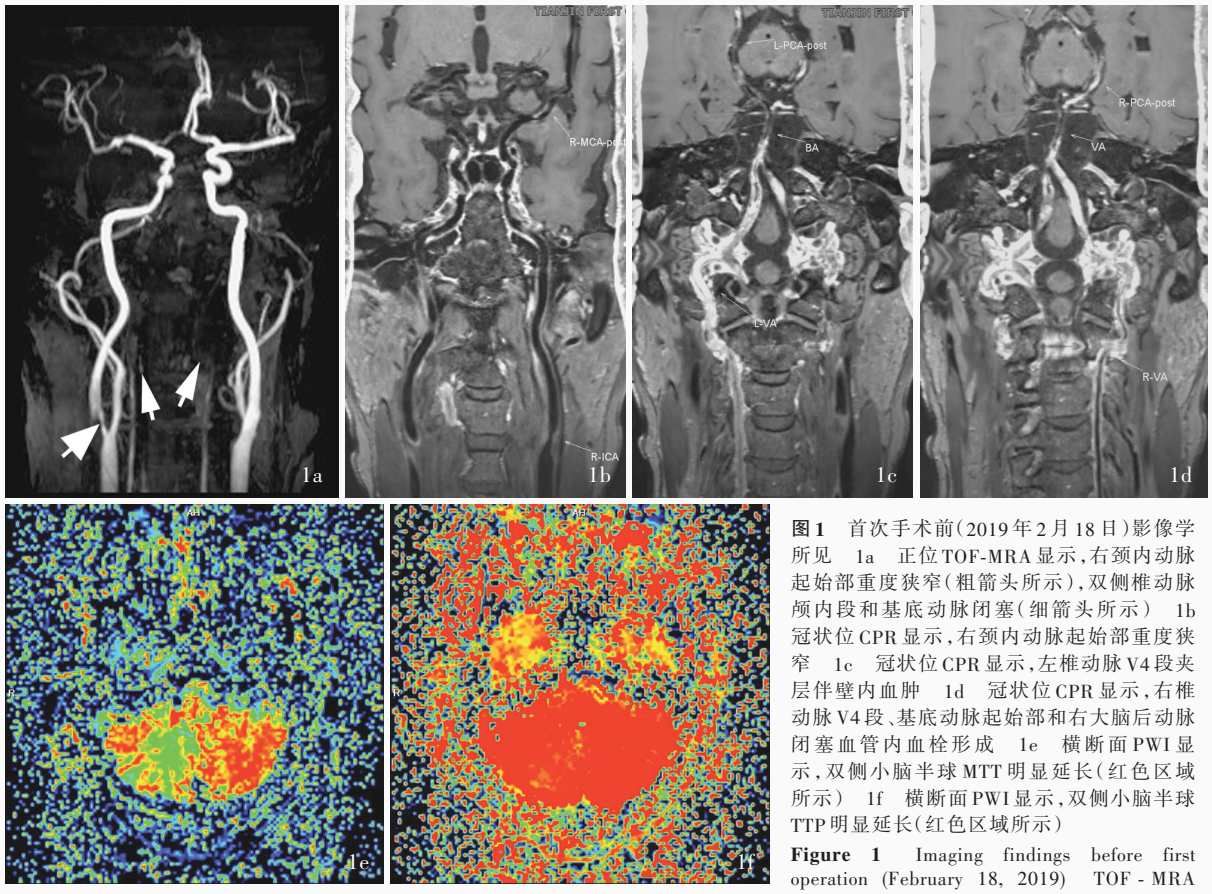

图1　首次手术前(2019年2月18日)影像学所见　1a　正位TOF-MRA显示,右颈内动脉起始部重度狭窄(粗箭头所示),双侧椎动脉颅内段和基底动脉闭塞(细箭头所示)　1b　冠状位CPR显示,右颈内动脉起始部重度狭窄　1c　冠状位CPR显示,左椎动脉V4段夹层伴壁内血肿　1d　冠状位CPR显示,右椎动脉V4段、基底动脉起始部和右大脑后动脉闭塞血管内血栓形成　1e　横断面PWI显示,双侧小脑半球MTT明显延长(红色区域所示)　1f　横断面PWI显示,双侧小脑半球TTP明显延长(红色区域所示)

Figure 1　Imaging findings before first operation (February 18, 2019)　TOF - MRA showed severe stenosis at the beginning of right ICA (thick arrow indicates), and the intracranial segment of bilateral VA and BA were not visualized (thin arrows indicate, Panel 1a). Coronal curved plannar reformation (CPR) showed severe stenosis at the beginning of right ICA (Panel 1b). Coronal CPR showed dissection of V4 segment of left VA with intramural hematoma (Panel 1c). Coronal CPR showed thrombosis in V4 segment of right VA, the beginning of BA and right PCA occlusion (Panel 1d). Axial PWI showed MTT of both cerebellar hemispheres was significantly extended (red areas indicate, Panel 1e). Axial PWI showed TTP of both cerebellar hemispheres was significantly longer (red areas indicate, Panel 1f).

脑前动脉A1段重度狭窄并可见稳定斑块;右大脑中动脉M1段中至重度狭窄并可见稳定斑块;其余颅内血管多发动脉粥样硬化改变(图1a~1d)。DWI显示,脑干、双侧脑桥臂、左侧小脑半球急性梗死灶。PWI显示,双侧小脑半球平均通过时间(MTT)和达峰时间(TTP)明显延长(图1e,1f)。临床诊断为脑干、双侧小脑半球多发急性缺血性卒中;双侧椎-基底动脉闭塞,右颈内动脉起始部和右大脑前动脉A1段重度狭窄,右大脑中动脉M1段狭窄;2型糖尿病,冠心病,缺血性卒中后遗症。于2019年2月13日在全身麻醉下行左椎-基底动脉再通治疗+右颈内动脉起始部球囊扩张术。术中可见右颈内动脉起始部重度狭窄(狭窄率约90%,图2a);右椎动脉纤细,起始部重度狭窄、末端闭塞(图2b);左椎动脉为优势侧,V4段以远闭塞,基底动脉闭塞(图2c,2d)。以长度260 cm的交换导丝将6F导引导管(ENVOY,美国Johnson & Johnson Cordis公司)选择性进入左椎动脉枢椎(C_2)水平,全身肝素化(初始剂量为3000 U,再以1000 U/h维持);在Synchro-14微导丝(200 cm,美国Stryker公司)引导下将Excelsior SL-10微导管置入基底动脉末端,造影证实其进入闭塞段真腔;置换为Synchro-14微导丝(300 cm,美国Stryker公司)后撤下微导管,然后将Gateway球囊(2 mm×15 mm)置入椎动脉末端闭塞处,并轻柔加压2次,造影显示椎动脉末端再通成功,可见前向血流,远端末梢血管显影,基底动脉显影(图2e~2g);撤出导丝和球囊,于泥鳅导丝引导下将导引导管置入右颈总动脉末端,于Synchro-14微导丝(300 mm)引导下将Spider FX保护伞(5 mm,美国 Medtronic公司)超选择性导入右颈内动脉岩骨段,以Invatec PTA球囊(5 mm×40 mm,美国Medtronic公司)扩张狭窄段,造影显示狭窄段较前稍成形满意,但仍遗

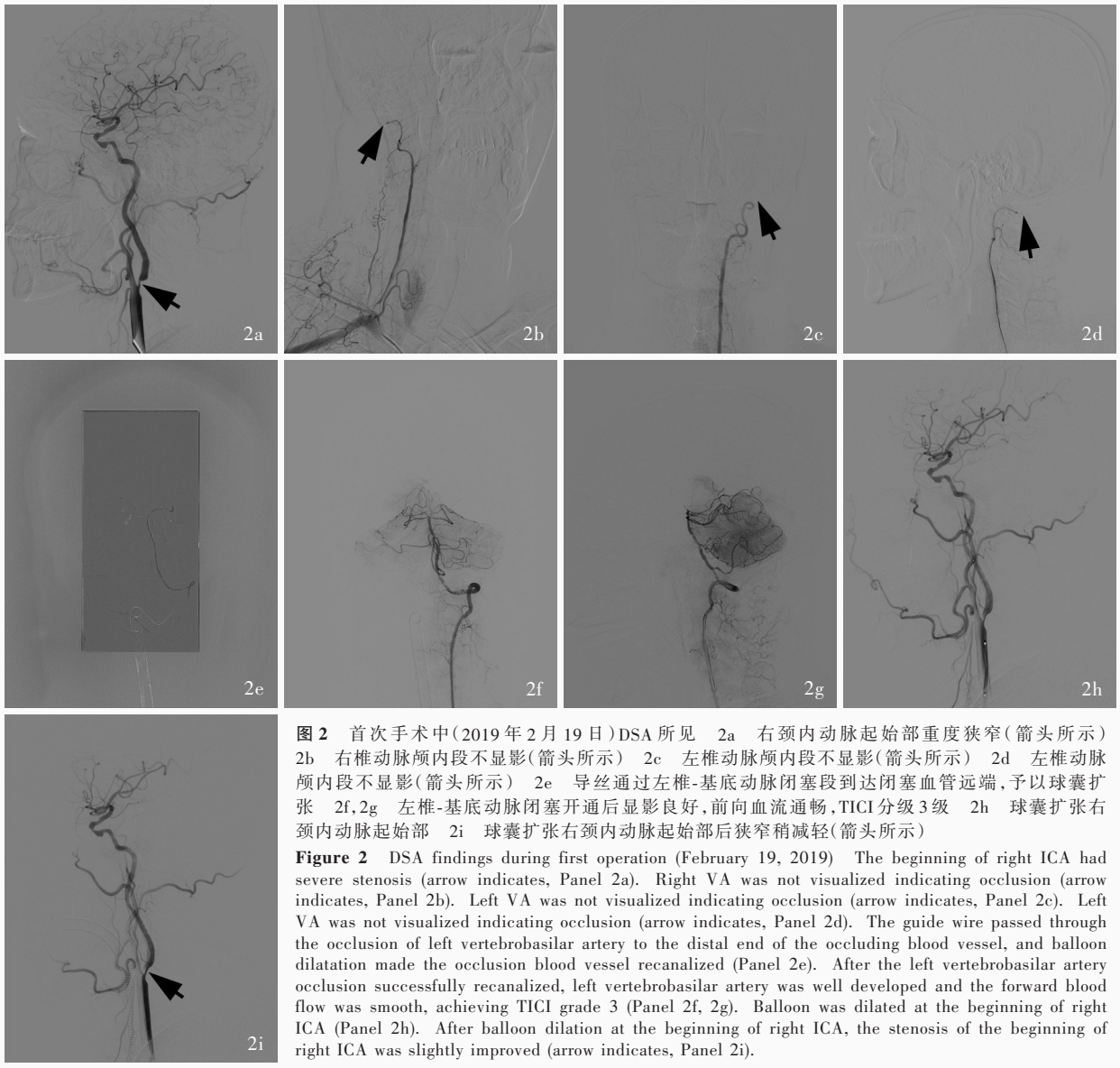

图2 首次手术中(2019年2月19日)DSA所见 2a 右颈内动脉起始部重度狭窄(箭头所示) 2b 右椎动脉颅内段不显影(箭头所示) 2c 左椎动脉颅内段不显影(箭头所示) 2d 左椎动脉颅内段不显影(箭头所示) 2e 导丝通过左椎-基底动脉闭塞段到达闭塞血管远端,予以球囊扩张 2f,2g 左椎-基底动脉闭塞开通后显影良好,前向血流通畅,TICI分级3级 2h 球囊扩张右颈内动脉起始部 2i 球囊扩张右颈内动脉起始部后狭窄稍减轻(箭头所示)

Figure 2 DSA findings during first operation (February 19, 2019) The beginning of right ICA had severe stenosis (arrow indicates, Panel 2a). Right VA was not visualized indicating occlusion (arrow indicates, Panel 2b). Left VA was not visualized indicating occlusion (arrow indicates, Panel 2c). Left VA was not visualized indicating occlusion (arrow indicates, Panel 2d). The guide wire passed through the occlusion of left vertebrobasilar artery to the distal end of the occluding blood vessel, and balloon dilatation made the occlusion blood vessel recanalized (Panel 2e). After the left vertebrobasilar artery occlusion successfully recanalized, left vertebrobasilar artery was well developed and the forward blood flow was smooth, achieving TICI grade 3 (Panel 2f, 2g). Balloon was dilated at the beginning of right ICA (Panel 2h). After balloon dilation at the beginning of right ICA, the stenosis of the beginning of right ICA was slightly improved (arrow indicates, Panel 2i).

留狭窄(狭窄率约为80%;图2h,2i),待二期手术,回收保护伞,结束手术。术后即刻血压135/70 mm Hg(1 mm Hg = 0.133 kPa),送入神经重症监护病房持续心电监护,血压平稳,基本控制在110~130/60~80 mm Hg。术后6小时行头部CT检查未见颅内出血(图3),予低分子肝素4000 U/d皮下注射3天,阿司匹林100 mg/d和氯吡格雷75 mg/d口服双联抗血小板治疗,普罗布考250 mg/次(2次/d)和阿托伐他汀20 mg/晚口服调脂治疗。患者住院15天,出院时头晕、下肢无力症状好转。术后3个月(2019年5月7日)MRA示椎-基底动脉再狭窄(图4)。术后6个月(2019年8月24日)入院随访,MRA未见椎-基底动脉再狭窄(图5a,5b),PWI显示双侧小脑半球MTT和TTP基本恢复正常(图5c,5d);DSA无椎-基底动脉再狭窄,右颈内动脉残留狭窄率>90%,遂行右侧颈内动脉支架植入术,术后即刻造影显示狭窄血管血流明显改善(图6)。患者共计住院5天,出院后随访至二次术后9个月,复查CTA显示右颈内动脉起始部和椎-基底动脉血流通畅,未见明显再狭窄(图7)。

讨 论

血流动力学障碍和闭塞远端栓塞是非急性颅内动脉闭塞的主要机制[19-21],而闭塞远端脑低灌注

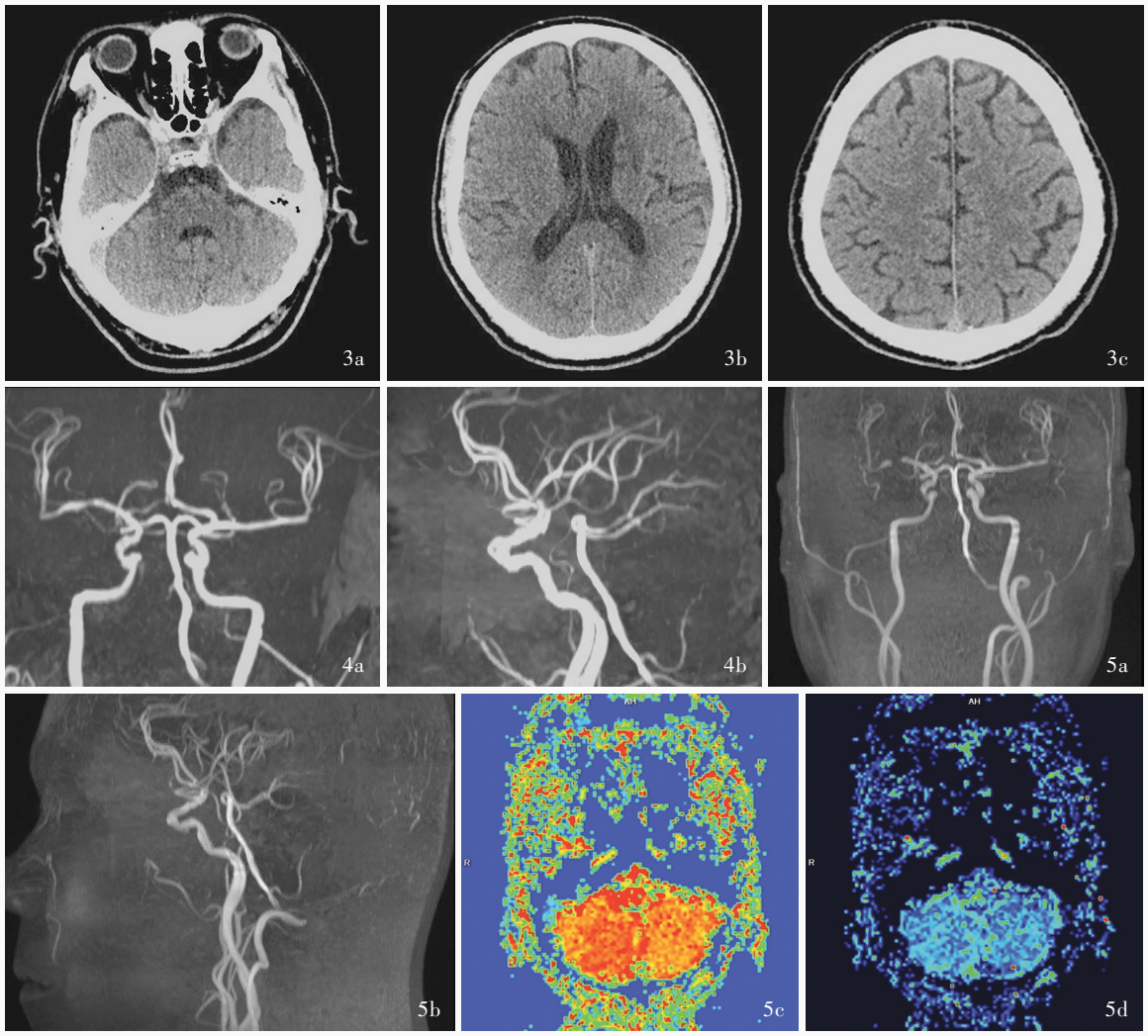

图3　首次手术后即刻(2019年2月19日)头部CT检查未见出血　3a　蝶鞍层面　3b　侧脑室层面　3c　大脑皮质层面　**图4**　首次手术后3个月(2019年5月7日)MRA显示,基底动脉未见狭窄,左椎动脉未见狭窄,右椎动脉未见流空影　4a　正位像　4b　侧位像　**图5**　首次手术后6个月(2019年8月24日)影像学检查所见　5a,5b　冠状位和矢状位MRA显示,右颈内动脉起始部狭窄基本同前,双侧椎-基底动脉未见再狭窄　5c　横断面PWI显示,双侧小脑TTP基本恢复正常　5d　横断面PWI显示,双侧小脑MTT基本恢复正常

Figure 3　Head CT immediately after first operation (February 19, 2019) showed no bleeding. The sella level (Panel 3a). The lateral ventricle level (Panel 3b). The cerebral cortex level (Panel 3c). **Figure 4**　MRA findings at 3 months after first operation (May 7, 2019) showed no bilateral vertebral-basal artery restenosis. Anteroposterior MRA (Panel 4a). Lateral MRA (Panel 4b). **Figure 5**　Imaging findings at 6 months after first operation (August 24, 2019) Coronal and sagittal MRA showed the right ICA stenosis was basically the same as before, and no bilateral vertebral-basal artery restenosis (Panel 5a, 5b). Axial PWI showed the bilateral cerebellar TTP basically restored to normal (Panel 5c). Axial PWI showed the bilateral cerebellar MTT basically restored to normal (Panel 5d).

是其导致缺血性卒中复发的主要机制[22-23],因此,改善闭塞远端脑低灌注可以降低非急性颅内动脉闭塞患者脑卒中复发率和病死率。目前的治疗方法主要包括药物治疗、颅内外血管搭桥术和颞肌贴敷治疗、血管再通治疗,但其疗效和安全性均缺乏足够的循证医学证据,故目前尚无一致性意见。

既往非急性颅内动脉闭塞主要采取内科保守治疗或颅内外血管搭桥术、肌肉贴敷治疗。溶栓、抗血小板聚集、调脂等药物治疗的远期疗效通常较差,长期脑低灌注不仅给患者带来各种症状和痛苦,而且易引起缺血性卒中等灾难性事件[15,24]。有经验的医疗中心开展颅内外血管搭桥术和肌肉贴敷治疗可能对症状性非急性颅内动脉闭塞患者有益,但围手术期并发症发生率较高,手术适应证、手术时机和手术方式尚待大样本临床研究的进一步明确[4]。近年来,随着神经介入技术和材料的发展,

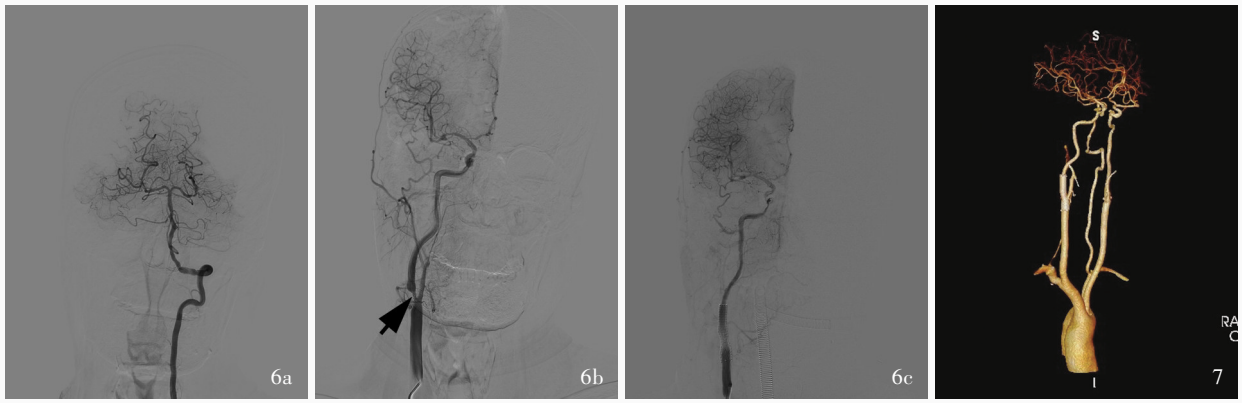

图6 二次手术中(2019年8月28日)DSA所见 6a 左椎-基底动脉未见再狭窄 6b 右颈内动脉起始部重度狭窄(箭头所示) 6c 右颈内动脉起始部支架植入术后狭窄得以明显改善 **图7** 二次手术后9个月(2020年5月15日)CTA显示,右颈内动脉起始部和椎-基底动脉通畅,未见明显再狭窄

Figure 6 DSA findings during second operation (August 28, 2019) No left vertebral-basal artery restenosis (Panel 6a). Severe stenosis at the beginning of right ICA (arrow indicates, Panel 6b). After the stent placement at the beginning of right ICA the stenosis was significantly improved (Panel 6c). **Figure 7** CTA at 9 months after second operation (May 15, 2020) showed the initial part of right ICA and vertebro-basilar artery were unobstructed without obvious restenosis.

非急性颅内动脉闭塞的血管再通治疗已逐渐成为可能,与颅内外血管搭桥术和肌肉贴敷治疗相比,血管再通治疗针对闭塞血管远端供血区的某一或某些血管,可使闭塞血管原路再通,血供更充足,更符合生理通道、血流动力学特征,且手术创伤小、手术风险也相对较低[25-27]。动脉粥样硬化性颅内大血管闭塞好发于前循环,主要是颈内动脉颅内段和大脑中动脉,其中尤以大脑中动脉闭塞(MCAO)最为常见,后循环闭塞主要发生于基底动脉[4,28-31];本研究61例症状性非急性颅内动脉闭塞患者的闭塞部位分别位于大脑中动脉水平段23例、颈内动脉床突上段16例、椎-基底动脉交界区12例、优势侧或双侧椎动脉颅内段10例,与既往文献报道基本一致。经血管再通治疗后,53例(86.89%)成功开通血管,术后记忆力减退、头晕、偏身麻木、视物模糊和复视症状基本消失,构音障碍、共济失调、偏瘫症状不同程度缓解,术后随访6~24个月预后良好率为77.19%(44/57),4例发生支架内再狭窄,但均无临床症状,未予处理,表明对于部分症状性非急性颅内动脉闭塞患者,血管再通治疗在技术上是可行的,且疗效肯定,远期预后良好。

然而,非急性颅内动脉闭塞的血管再通治疗手术难度较大,对术者的神经介入技术储备、临床经验和围手术期管理水平要求较高,且有一定的围手术期风险,如术中栓子脱落导致新的栓塞、动脉夹层、导丝刺破血管、术后脑高灌注综合征等[32-33]。本研究有8例患者(13.11%)血管再通失败,其中4例因导丝无法通过闭塞段而放弃手术、1例因导丝进入穿支动脉致破裂出血死亡、3例因术后过度灌注脑出血而死亡。

通过初步探讨症状性非急性颅内动脉闭塞的血管再通治疗,笔者认为应做好仔细规范的术前评估、严格的纳入对象筛选,以及良好的血压控制等围手术期管理。(1)准确评估闭塞段管壁结构、闭塞节段、管壁病变性质等,VWI有助于提供详细的闭塞段管壁影像学信息。(2)头颈部CTA晚期成像可见闭塞远端血管影像,再结合头颈部血管造影,可初步判断闭塞段及其远端血管是否通畅、有无血栓等。(3)术中操作应耐心、细致,对照术前VWI影像,微导丝通过闭塞段时进行多角度投照造影,时刻判断微导丝走向,及时调整角度和力度,切忌微导丝暴力通过闭塞段,可能导致微导丝刺破血管致颅内出血。(4)经微导管造影并在路径图引导下,将3 m微导丝置入闭塞远端以明确闭塞远端的血管路径,探寻闭塞段起止部位及其闭塞远端正常管腔,避免刺入管壁或刺破管壁,导致灾难性事件。(5)选择球囊进行扩张时应遵照球囊由小到大的原则。

综上所述,症状性非急性颅内动脉闭塞行血管再通治疗具有符合生理通道、有血流动力学基础、技术可行、手术创伤小、显效迅速、患者易接受等优点,在有经验的医疗中心围手术期并发症发生率也较低,患者长期预后良好,因此,血管再通治疗可以

作为症状性非急性颅内动脉闭塞的一种安全、有效的治疗方法。然而，神经介入技术要求较高，术者需具有一定的技术储备和临床经验，同时还需一支良好的治疗团队与护理团队精诚合作，严格筛查患者，逐步扩大适应证。

利益冲突 无

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《中国现代神经疾病杂志》编辑部关于稿件统计分析方法的要求

《中国现代神经疾病杂志》编辑部对来稿中的统计分析方法一律要求明确研究设计方法,以及详细描述资料性质和结果,具体要求如下:

1.研究设计方法　要求交代研究设计的名称和主要方法。如调查设计应写明是前瞻性、回顾性还是横断面调查研究;实验设计应写明具体设计类型,如自身配对设计、成组设计、交叉设计、析因设计或正交叉设计等;临床试验设计应写明属于第几期临床试验,采用何种盲法措施等。应围绕"重复、随机、对照、均衡"四项基本原则进行概要说明,尤其要说明如何控制重要的非试验因素的干扰和影响。

2.资料及结果的表达与描述　采用均数±标准差($\bar{x}\pm s$)表示近似服从正态分布的定量资料,采用中位数和四分位数间距[$M(P_{25},P_{75})$]表示呈偏态分布的定量资料;采用相对数构成比(%)或率(%)表示计数资料,用相对数构成比时分母不能小于20。应写明所用统计分析方法的具体名称、统计量具体值,应尽可能给出确切的P值;当涉及总体参数时,在给出显著性检验结果的同时,给出95%CI。