

多参数监测在颈动脉内膜斑块剥脱术中的应用

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【摘要】目的 探讨多参数监测在颈动脉内膜斑块剥脱术(CEA)中的作用。方法 回顾性分析 2016 年 5 月至 2021 年 12 月在多参数联合监测下实施 CEA 治疗的 75 例颈动脉狭窄的临床资料。术中应用颈内动脉返流压及体感诱发电位、运动诱发电位监测。结果 72 例返流压≥25 mmHg,3 例<25 mmHg;58 例体感诱发电位无明显变化,2 例轻度降低复通后好转,6 例下降超过 50% 但恢复,5 例下降超过 50% 未恢复,4 例下降超过 75% 未恢复。术中 5 例使用转流管。术后发生脑卒中 2 例,未发生栓塞事件。术后 1 周内复查颈动脉 CTA 显示颈总动脉及颈内动脉均通畅,1 例颈外动脉闭塞,1 例颈外动脉血栓形成并管腔重度狭窄。术后随访 3 个月~5 年,末次随访 GOS 评分 5 分 74 例,3 分 1 例。结论 CEA 是预防缺血性脑卒中的有效方法,术中联合监测颈动脉返流压、体感诱发电位和运动诱发电位,是可行的、有效的,可提高 CEA 的效果。

【关键词】颈动脉狭窄;颈动脉内膜斑块剥脱术;颈内动脉返流压;体感诱发电位;运动诱发电位;疗效

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Application of multi-parameter monitoring to carotid endarterectomy for patients with carotid artery stenosis

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【Abstract】Objective To investigate the clinical efficacy of carotid endarterectomy (CEA) under multi-parameter monitoring for patients with carotid artery stenosis (CAS). Methods The clinical data of 75 patients with CAS who underwent CEA under multi-parameters monitoring from May 2016 to December 2021 were retrospectively analyzed. During the operation, the stump pressure (StP) of the internal carotid artery (ICA), somatosensory evoked potentials (SSEP) and motor evoked potentials (MEP) were monitored simultaneously. Results CEA was completed in all the patients. The StP of 72 patients was more than 25 mmHg and 3 less than 25 mmHg. SSEP did not significantly change in 58 patients, mildly decreased in 2 patients with improvement after recirculation, dropped by more than 50% with recovery in 6 patients, dropped by more than 50% without recovery in 5 patients, and dropped by more than 75% without recovery in 4 patients. Selective shunt was used in 5 patients during the operation. The postoperative ischemic events occurred in 2 patients. No embolization occurred after the operation. CTA within 1 week after surgery showed that the common carotid artery and ICA were patency in all the patients, external carotid artery occlusion occurred in 1 patient, and severe stenosis of external carotid artery occurred in 1 patient. The follow-up (range, 3 months to 5 years) showed a GOS score of 5 in 74 patients and a score of 3 in 1 at the last follow-up. Conclusions CEA is an effective method for the prevention of ischemic stroke. Intraoperative monitoring of StP, SSEP, and MEP is feasible and effective, which can improve the effectiveness of CEA.

【Key words】Carotid endarterectomy; Stump pressure; Somatosensory evoked potential; Motor evoked potential

脑血管疾病是我国病死率、致残率最高的疾病<sup>[1]</sup>,其中颈动脉狭窄是缺血型脑卒中的常见原因。多项临床随机对照试验证实颈动脉内膜斑块剥脱术(carotid endarterectomy, CEA)能够有效降低颈动脉狭窄病人的卒中风险<sup>[2,3]</sup>,是治疗颈动脉狭窄、预防卒中的有效方法<sup>[4,5]</sup>。术中监测可提高手术安全。目前常用的监测手段有颈内动脉返流压<sup>[6,7]</sup>、经颅多普勒超声<sup>[8-10]</sup>、脑电图<sup>[11]</sup>、体感诱发电位<sup>[12,13]</sup>、运动诱发电位

<sup>[14,15]</sup>、近红外分光光谱仪监测脑氧饱和度<sup>[16-18]</sup>等,但目前并没有哪种方法能准确预测术中脑缺血事件,也不能避免转流管不必要的使用。近年来,临床多推荐两种或多种手段联合监测预测脑卒中<sup>[19]</sup>,以增加手术安全性。我们 CEA 中监测颈内动脉返流压及体感诱发电位和运动诱发电位,取得良好的效果,现报道如下。

1 资料与方法

1.1 病例选择标准 纳入标准:症状性病人颈内动脉狭窄率>50%、无严重的心肺功能障碍;无症状性病人颈内动脉狭窄率>70%、无严重的心肺功能障碍;术前规律服用控制血压、血脂及抗血小板聚集药物;

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病人依从性好,能配合长期随访;6个月内无心肌梗死、消化道出血、全麻手术病史;无恶性肿瘤;收缩压低于 180 mmHg、血糖平稳(8~10 mmol/L)。

排除标准:颈内动脉狭窄率<50%,或血管狭窄率>50%但无脑梗死、短暂性脑缺血发作或一过性黑蒙等症状;对侧肢体完全瘫痪;同侧有未处理的高风险颅内动脉瘤;血管炎或发育不良性血管狭窄;长段狭窄或多发狭窄;痴呆、精神症状等不能配合。

1.2 研究对象 回顾性分析 2016 年 5 月至 2021 年 12 月在联合监测下实施 CEA 治疗的 75 例颈动脉狭窄的临床资料,其中男 67 例,女 8 例;平均年龄( $65.16 \pm 7.71$ )岁;体质指数  $18.5 \sim 24 \text{ kg/m}^2$  有 37 例, $<18.5 \text{ kg/m}^2$  或  $>24 \text{ kg/m}^2$  有 38 例;脑梗死 49 例,短暂性脑缺血发作 10 例,一过性黑蒙 5 例,无症状 11 例;既往吸烟史 42 例,饮酒史 29 例;合并高血压 53 例,糖尿病 30 例,高脂血症 14 例;使用抗血小板药物 74 例、他汀类药物 73 例、降糖药物 31 例。

1.3 术前准备 入院后完善血管检查,如颈动脉超声、颈动脉和颅内动脉 CTA 或 DSA,详细评估以下几个方面:颈内动脉狭窄程度及颈内动脉和大脑中动脉流速、颈动脉斑块性质及稳定性、颈动脉狭窄长度、颈内动脉流入道与流出道通畅度、颅内尤其是同侧有无未处理的动脉瘤、对侧颈内动脉狭窄程度、颅内 Willis 环即前交通动脉和双侧后交通动脉是否开通、同侧颅内脑组织有无低灌注等。术前 1 周停用波立维但继续给予拜阿司匹林单药抗血小板以及强化他汀治疗。

1.4 手术方法 采用经鼻插管(明确低位颈动脉分叉可以经口插管)麻醉,监测体感诱发电位(somatosensory evoked potentials, SSEP)、运动诱发电位(motor evoked potentials, MEP),术前超声标记颈动脉分叉,锐性分离、原位解剖至颈动脉鞘。全身肝素化、升血压,依次阻断颈内动脉、颈总动脉、颈外动脉,计时并测量颈内动脉返流压,同时关注电生理监测结果。纵行剪开颈内动脉、颈总动脉,仔细辨认层次分离斑块,仔细摘除斑块碎屑,颈内动脉内膜残端 7#0 血管缝线固定 2 针,分别释放临时阻断钳冲刷斑块碎屑,6#0 血管缝线连续缝合血管,降血压,必要时中和肝素,依次开放颈外动脉、颈总动脉、颈内动脉。

1.5 术中监测 术中监测颈内动脉返流压联合 SSEP、MEP,如果两项监测均显示脑血流低灌注,则给予颈动脉转流管临时恢复血流。报警标准:SSEP 潜伏期延长 10%和/或波幅降低 50%;MEP 波幅消失;颈内动脉返流压低于 25 mmHg。3 项中任意 1 项满足条

件即报警。SSEP 上肢观察 N20 潜伏期和波幅,下肢观察 P40 潜伏期和波幅;MEP 观察上肢拇短展肌和下肢拇展肌的复合肌肉动作电位潜伏期、波幅。报警时,暂停手术,并去除引发监测电位异常的原因,待监测指标接近正常后继续手术。

## 2 结果

2.1 电生理监测情况 75 例中,58 例 SSEP 无明显变化,2 例轻度降低复通后好转,6 例下降超过 50%但恢复,5 例下降超过 50%未恢复,4 例下降超过 75%未恢复;1 例 MEP 需加大刺激能量。

2.2 围手术期情况 术中 5 例使用转流管。术后 1 例出现短暂性脑缺血发作,1 例因过度灌注致对侧肢体轻瘫。术后未发生栓塞事件。

2.3 随访情况 术后随访 3 个月~5 年。术后 1 周内复查颈动脉 CTA 显示颈总动脉及颈内动脉均通畅,1 例颈外动脉闭塞,1 例颈外动脉血栓形成并管腔重度狭窄。末次随访 GOS 评分 5 分 74 例,3 分 1 例(双侧颈动脉狭窄未及时行对侧 CEA)。

## 3 讨论

目前,CEA 被认为是处理中重度颈动脉狭窄的第一选择。CEA 中需要临时阻断颈总动脉、颈内动脉和颈外动脉,阻断过程中可能会出现同侧脑组织低灌注致脑缺血缺氧,可能需要使用转流管,将颈总动脉与颈内动脉临时接通保证脑组织血流。CEA 中是否需要使用转流管,需要有一定的监测指标来指导。目前常用的监测手段有 SSEP、MEP、颈动脉返流压、经颅多普勒超声、近红外光谱仪监测脑组织氧饱和度、脑电图<sup>[6-18]</sup>等,但尚没有哪一种监测方法被证明能完全预测脑缺血事件。我们采用监测颈内动脉返流压、SSEP 和 MEP,有两个指标提示同侧脑组织严重缺血情况下考虑行临时颈总动脉-颈内动脉转流;本文 9 例出现 SSEP 波幅下降 50%以上未恢复,其中 1 例 MEP 可以引出,未转流,仅升高血压、快速缝合血管后开通颈动脉,SSEP 好转;1 例 MEP 未引出、返流压亦低,诱发电位异常发生在血管缝合快结束时,亦未转流。从我们的临床经验来看,联合电生理监测手术效果良好,各项指标正常时可以从容不迫地完成手术,如有指标异常,可以提醒术者改变操作,增加手术安全性。本文总体临床效果好,可能与有监测以后可以从容完成内膜斑块的精细处理有关。

总之,CEA 能很好地防治颈动脉中重度狭窄引

起的脑缺血性事件,术中联合监测颈动脉返流压、SSEP 和 MEP,是可行的、有效的,可提高 CEA 的效果。

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