

心脏手术围手术期急性缺血性卒中血管内机械取栓治疗

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【摘要】 缺血性卒中是心脏手术围手术期的严重并发症,血管内机械取栓术是急性缺血性卒中的有效治疗方法,尤其对于无法静脉溶栓的心脏手术后患者。但心脏手术围手术期行机械取栓术的比例明显低于非心脏手术,且疗效尚不十分明确,有待大量临床研究进一步提供证据支持。

【关键词】 心脏外科手术; 围手术期; 缺血性卒中; 血栓切除术; 综述

Endovascular thrombectomy for acute ischemic stroke in the perioperative period of cardiac surgery

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【Abstract】 Ischemic stroke is a serious complication during the perioperative period of cardiac surgery. Endovascular mechanical thrombectomy is an effective treatment for acute ischemic stroke, especially for patients after cardiac surgery who cannot undergo intravenous thrombolysis. However, for this specific patients in the perioperative period of cardiac surgery, the proportion of mechanical thrombectomy is significantly lower than in non-cardiac surgery patients. The therapeutic effect of mechanical thrombectomy in this context is not yet fully clear and require extensive clinical research for further validation.

【Key words】 Cardiac surgical procedures; Perioperative period; Ischemic stroke; Thrombectomy; Review

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围手术期脑卒中系指手术期间或术后 30 天内发生的缺血性或出血性(脑出血或蛛网膜下腔出血)卒中,是手术严重并发症。成人非心脏和非神经外科手术中脑卒中发病率为 0.1%~0.7%,而心脏手术中发病率为 1%~5%,且围手术期缺血性卒中占比(约 95%)远高于出血性卒中(约 5%)^[1]。与一般外科手术相比,心脏手术与缺血性卒中高风险相关,因此美国心脏协会(AHA)/美国卒中协会(ASA)发布的围手术期脑卒中预防与治疗指南中,心脏手术常独立评价^[2]。尽管血管内机械取栓术在急性大血管闭塞性缺血性卒中中的应用已获得高质量的

循证医学证据支持,但其在心脏手术后缺血性卒中的应用和疗效尚缺乏有力证据。本文拟对心脏手术围手术期缺血性卒中发病率、发病机制、机械取栓术的应用及疗效等进行重点阐述。

一、心脏手术围手术期急性缺血性卒中的发病率

心脏手术围手术期缺血性卒中发病率为 1%~5%,且开放性手术通常高于经皮介入手术,冠状动脉旁路移植术(CABG)后脑卒中发病率约为 1.3%,主动脉瓣置换术(AVR)后为 2.6%~10%^[3],急性 Stanford A 型主动脉夹层紧急全主动脉弓置换术后达 12%^[4],心室辅助心脏支持装置植入术后高达 20%~30%^[5-6];经导管主动脉瓣植入术(TAVI)后脑卒中发病率为 2.3%~2.8%^[7],经皮冠状动脉介入术(PCI)后为 0.2%~0.5%^[8]。然而,《Eur Heart J》发表的一项系统综述和 Meta 分析显示,经导管主动脉瓣植

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入术后约 74% 患者新发无症状性缺血性卒中^[9]。

二、心脏手术围手术期急性缺血性卒中的发病机制

约 50% 的心脏手术围手术期急性缺血性卒中发生于术后 24 小时内,主要原因为血栓栓塞、低灌注、低氧、贫血、大动脉狭窄,其中血栓栓塞占 70%~80%,是直接心脏和(或)动脉操作以及术中体外循环所致^[10-12];低灌注和混合原因引起的分水岭梗死较血栓栓塞少见,占 10%~30%^[13];颈动脉狭窄程度是心脏手术围手术期发生缺血性卒中的独立预测因素^[14]。冠状动脉旁路移植术中,缺血性卒中风险从无颈动脉颅外段狭窄的 <2% 增至单侧颈动脉狭窄的 3%、至双侧颈动脉狭窄的 5%、再至颈动脉闭塞的 7%~11%^[15-16]。术中和术后早期缺血性卒中通常由手术或麻醉相关因素引起;围手术期后(术后 >30 天)缺血性卒中主要与患者一般状况或术后抗凝和抗血小板治疗不充分相关,如收缩压升高、房颤、心输出量下降、暴露于颗粒物污染、高体重指数、糖尿病和吸烟等;手术通常可诱发全身炎症反应、血液浓缩和静脉淤血,术后抗凝和抗血小板治疗不充分可导致血栓形成风险增加^[13]。

三、心脏手术围手术期急性缺血性卒中的机械取栓治疗

2015 年, *N Engl J Med* 发表 5 项随机对照临床试验,证实机械取栓术对急性前循环大血管闭塞性缺血性卒中有效^[17]。此后的 MR CLEAN-LATE 试验 (Multicenter Randomized Clinical Trials of Endovascular treatment of Acute Ischemic Stroke in the Netherlands) 不断拓宽大血管闭塞性缺血性卒中的治疗“时间窗”^[18]。《急性缺血性卒中血管内治疗中国指南 2023》^[19]指出,发病 24 小时内的急性前循环和后循环大血管闭塞患者经临床和影像学筛选后,符合现有循证医学证据,均推荐机械取栓术。最新研究证据显示,大面积缺血性卒中患者 24 小时内行机械取栓术较单纯药物治疗预后更佳^[20]。鉴于心脏手术后静脉溶栓常伴有颅内出血、颅内肿瘤、近 3 个月严重颅脑创伤或脑卒中病史、近 2 周大型外科手术史等禁忌证,机械取栓术成为围手术期急性缺血性卒中的首选治疗方案。然而目前关于心脏手术围手术期机械取栓术的研究较少,且多为回顾性研究、单中心病例对照研究或病例报道。2020 年的一项系统综述纳入 5231 例心脏手术后急性缺血性卒中患者,仅 14 例心脏手术后行机械取栓

术,其中 7 例神经功能预后良好、5 例预后中等、2 例预后较差,由于病例数较少,无法全面了解机械取栓术对神经功能预后的总体影响^[21]。2021 年的一项单中心、回顾性研究纳入 7112 例心脏手术患者,163 例 (2.29%) 术后 30 天内发生急性缺血性卒中,其中 15 例为大血管闭塞,但仅 6 例行机械取栓术,其恢复独立生活的可能性明显高于药物治疗患者 (4/6 对 0/9, $P = 0.010$),但该项研究为单中心研究,心脏手术较复杂,围手术期死亡患者可能导致大血管闭塞被低估,且另有一些临床症状轻微的大血管闭塞患者因无法识别而未被纳入^[22]。2022 年的一项研究回顾澳大利亚皇家阿德莱德医院 5022 例急性缺血性卒中患者,870 例行机械取栓术,其中 7 例为心脏手术后行机械取栓术,心脏手术分别为冠状动脉旁路移植术 2 例、经导管主动脉瓣植入术 2 例、再次主动脉瓣置换术 1 例、二尖瓣修复术 1 例、主动脉瓣与二尖瓣置换术 + 冠状动脉旁路移植术 1 例,心脏手术后至脑卒中症状发作的中位时间为 3 天,美国国立卫生研究院卒中量表 (NIHSS) 中位评分为 26 分,出院之后转入另一所医院 3 例、进入康复中心 2 例、回归家庭 2 例,表明心脏手术后发生急性缺血性卒中的患者经机械取栓术可获得良好预后^[23]。为填补这一研究领域的空白,更好地了解心脏手术后机械取栓术的有效性和安全性,de Havenon 等^[24]回顾分析美国 4888 所医院共 667 761 例急性缺血性卒中患者的临床资料,其中 23 854 例行机械取栓术,心脏手术组行机械取栓治疗的比例低于无心脏手术组 [1.60% (194/12 093) 对 3.80% (23 660/622 314), $P < 0.001$],但治疗后回归家庭的概率提高 2 倍 (95%CI: 1.140~4.290);其中,心脏移植和心室辅助装置植入手术中脑卒中发病率最高,其次为开放性瓣膜手术,与既往研究结果相一致^[5-6]。然而,诊断延误(心脏手术特别是开放性手术患者常因麻醉药镇静作用而延误诊断^[25])、临床医师因感知到较高的手术风险而拒绝机械取栓术、发病时患者不符合适应证如灌注成像 (PWI) 显示缺乏缺血半暗带等,常导致心脏手术后发生急性缺血性卒中的患者机械取栓术的应用率较低^[26]。

四、心脏手术围手术期急性缺血性卒中的预防与管理以及机械取栓治疗的未来

既往 20 年对围手术期脑卒中风险和后遗症的认识有所提高,但围手术期脑卒中管理并未取得实质性进展。心脏手术围手术期脑卒中管理的关键

是开发可靠的预测工具以评估脑卒中风险,术前完善脑血管评估和脑血流储备能力评估;术中加强个体化抗血小板和抗凝治疗、脑灌注监测、栓塞保护和神经细胞保护策略;术后缩短麻醉药应用时间,进行全面的神经系统检查,对疑似脑卒中的患者尽快完善床旁 CT 和(或)MRI 等影像学检查,以尽早发现脑灌注异常或急性缺血性卒中,为此类患者行机械取栓术增加机会。机械取栓术业已成为急性缺血性卒中发病 24 小时内脑灌注良好患者的有效治疗方法,血管成功再通亦可显著减轻心脏手术后急性缺血性卒中的神经功能缺损、降低病死率,但鉴于心源性栓塞(CE)栓子性质的特异性,采用何种术式、机械取栓术的最佳“时间窗”、如何减少术后脑出血或脑过度灌注综合征(CHS)等并发症,将成为我们关注的重点,这些问题均有待开展更多高质量的临床研究,以使我们更接近最小化围手术期脑卒中风险和改善患者远期预后的目标。

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· 小词典 ·

中英文对照名词词汇(一)

- 不明原因 stroke of undetermined etiology(SUE)
- 出血性梗死 hemorrhagic infarction(HI)
- 出血性转化 hemorrhagic transformation(HT)
- 串联病变 tandem lesions(TLs)
- 粗大运动商 gross motor quotient(GMQ)
- 促肾上腺皮质激素 adrenocorticotrophic hormone(ACTH)
- 错误发现率 false discovery rate(FDR)
- 大动脉粥样硬化 large artery atherosclerosis(LAA)
- 大脑中动脉 middle cerebral artery(MCA)
- 大血管闭塞 large vascular occlusion(LVO)
- 动静脉畸形 arteriovenous malformation(AVM)
- 动脉瘤性蛛网膜下腔出血
aneurysmal subarachnoid hemorrhage(aSAH)
- 短暂性脑缺血发作 transient ischemic attack(TIA)
- Gesell发展量表 Gesell Developmental Schedule(GDS)
- 改良Rankin量表 modified Rankin Scale(mRS)
- 改良脑梗死溶栓血流分级
modified Thrombolysis in Cerebral Infarction(mTICI)
- 感兴趣区 region of interest(ROI)
- 冠状动脉旁路移植术
coronary artery bypass grafting(CABG)
- CT灌注成像 CT perfusion imaging(CTP)
- 国际抗癫痫联盟
International League Against Epilepsy(ILAE)
- 国际脑出血外科手术试验
International Surgical Trial in Intracerebral Hemorrhage
(STICH)
- Glasgow昏迷量表 Glasgow Coma Scale(GCS)
- 机械取栓 mechanical thrombectomy(MT)
- 基底动脉 basilar artery(BA)
- 基于影像学评估的缺血性卒中血管内治疗3
Endovascular Therapy Following Imaging Evaluation for
Ischemic Stroke 3(DEFUSE 3)
- 急性基底动脉闭塞 acute basilar artery occlusion(ABAO)
- 急性前循环大血管闭塞
acute anterior circulation large vessel occlusion(AAC-LVO)
- 计算流体力学 computational fluid dynamics(CFD)
- 加拿大蒙特利尔神经病学研究所
Montreal Neurological Institute(MNI)
- 近端阻断导管 proximal occlusion catheter(POC)
- 经导管主动脉瓣植入术
Transcatheter Aortic Valve Implantation(TAVI)
- 经皮冠状动脉介入术
percutaneous coronary intervention(PCI)
- 经皮血管内成形术和支架植入术
percutaneous transluminal angioplasty and stenting(PTAS)
- 精细运动商 fine motor quotient(FMQ)
- 颈动脉内膜切除术 carotid endarterectomy(CEA)
- 颈动脉支架成形术 carotid artery stenting(CAS)
- 颈内动脉 internal carotid artery(ICA)
- 颈外动脉 external carotid artery(ECA)
- 颈总动脉 common carotid artery(CCA)
- 静脉溶栓 intravenous thrombolysis(IVT)
- 抗癫痫发作药物 antiepileptic seizure medicine(ASM)