

中国破裂颅内动脉瘤临床管理指南 (2024 版)

中华医学会神经外科学分会 中国卒中学会脑血管外科学分会 国家神经系统疾病医学中心 国家神经系统疾病临床研究中心

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【摘要】 动脉瘤性蛛网膜下腔出血(aSAH)严重危害我国人民健康。aSAH患者的预后差,其病死率可高达50%,是我国一个严峻的公共卫生问题。关于aSAH的临床评估、外科处理策略和围手术期管理是临床管理的重要组成部分。本临床管理指南围绕aSAH的流行病学、临床影像诊断、预后评价、治疗策略及选择、麻醉管理、围手术期护理和特殊人群aSAH管理建议等方面,共形成112条推荐意见,旨在为临床医师、其他相关专业人员提供实用的临床指导建议。

【关键词】 动脉瘤性蛛网膜下腔出血; 诊断; 治疗; 并发症; 管理; 指南

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Chinese guideline for the clinical management of patients with ruptured intracranial aneurysms (2024)

Society of Neurosurgery of Chinese Medical Association, Society of Cerebrovascular Surgery of Chinese Stroke Association, National Center for Neurological Disorders, National Clinical Research Center for Neurological Diseases

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【Abstract】 Subarachnoid hemorrhage caused by intracranial aneurysm (aneurysmal subarachnoid hemorrhage, aSAH) poses a significant threat to the health of the Chinese people. The prognosis of aSAH patients is poor, with a mortality of up to 50%, which is a public health problem in China. The clinical evaluation, surgical strategies, and perioperative management are important parts of clinical management for aSAH patients. This clinical management guideline consists of 112 recommendations on epidemiology, clinical imaging diagnosis, prognosis evaluation, treatment strategies and selection, anesthesia management, perioperative care, and management of special populations with aSAH, aiming to provide clinical guidance for clinical doctors and related professionals.

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[Key words] Aneurysmal subarachnoid hemorrhage; Diagnosis; Treatment; Complication; Management; Guidelines

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颅内动脉瘤是一种动脉壁异常膨出所形成的突起,普遍存在于全球成年人群中。据统计,全球范围内,50岁左右的人群中约有3%的患病率,在中国,35~75岁人群的未破裂颅内动脉瘤患病率约为7%^[1]。颅内动脉瘤破裂是导致蛛网膜下腔出血的主要原因,其全球发病率为(4~22)/10万,不同地区差异显著。特别是在日本和芬兰,颅内动脉瘤破裂导致的蛛网膜下腔出血尤为常见,且多发生在55~65岁的人群中,分别高达28/10万人年和16.6/10万人年^[2-3]。尽管不同地区的死亡率有所下降,但大多数患者仍遗留有明显的神经功能障碍,这给家庭和社会造成了沉重的负担,严重影响了患者的生活质量。随着影像学技术的进步和人口老龄化趋势,颅内动脉瘤的检出率逐渐提高。大多数颅内动脉瘤是偶然发现的,且表现形式多样。颅内动脉瘤的年破裂风险通常低于1%,但一旦发生破裂,其致死率和致残率极高。因此,颅内动脉瘤是一个严重影响全球人类健康的重大卫生问题。

欧洲卒中协会和美国卒中协会针对动脉瘤性蛛网膜下腔出血(aneurysmal subarachnoid hemorrhage, aSAH)陆续发布了临床管理指南。中国也不例外,中华医学会神经病学分会和中国医师协会神经介入专业委员会分别制订了《中国蛛网膜下腔出血诊治指南》(2015、2019版)和《中国颅内破裂动脉瘤诊疗指南2021》。随着新研究和证据的不断涌现,2023年的指南由中华医学会神经外科学分会和中国卒中学会脑血管病外科分会根据最新的指南制订要求更新,旨在为临床实践提供基于循证的实用建议。本指南通过检索文献证据,撰写推荐意见及展望未来方向三部分对aSAH的自然史及临床热点问题展开详细讨论。部分内容强调了我国在该领域的研究不足和未来研究方向,以使指南更加简洁、实用。此举旨在进一步规范化疾病的诊疗过程,提升医疗服务质量。《中国破裂颅内动脉瘤临床管理指南(2024版)》在内容上,全面涵盖了aSAH的流行病学与人群筛查、临床影像诊断、预后评价、治疗策略及选择、麻醉管理、围手术期护理和特殊人群aSAH管理建议。该指南主要面向颅

内动脉瘤相关专业的医务人员,适用于神经外科、神经内科、急诊科、重症医学、影像科等专业人员,为他们提供可参考的指导规范。

一、指南制订方法学

(一)指南制订工作小组和指南制订流程

在中国科学院院士赵继宗教授的指导下,中华医学会神经外科学分会和中国卒中学会脑血管外科分会委员于2021年9月组建了《中国颅内动脉瘤临床管理指南》的制订工作小组及编写委员会。该委员会明确了首席专家、工作小组组长及成员,并设立了证据审查委员会,从而建立了指南的组织框架。此外,委员会确定了指南的方法学原则,并举行了讨论会,会议内容主要包括未破裂动脉瘤和破裂动脉瘤两部分,每个专题均由1~2名相关领域专家共同完成。

为了制订该指南,委员会通过设定关键词和检索式,在包括万方数据库、CNKI、中国科技期刊全文数据库、Medline/PubMed、Cochrane 临床数据库等中文和英文数据库中进行文献检索,根据中国人群和其他人群研究的文献分类,体现中国指南的特点。检索关键词为“intracranial aneurysm”“subarachnoid hemorrhage”“epidemiology”“natural history”“management”“treatment, outcome”等。文献纳入标准随机对照研究、非随机观察性或注册研究、荟萃分析、临床病例或队列研究、专家共识等。检索时间范围从2000年1月1日至2022年12月31日,以编制文献检索报告及概要。基于循证证据,提出推荐意见,并经过证据审查委员会的审查。此外,工作小组还检索了2023年1~6月间可能影响指南推荐意见、建议等级及其证据水平的文献,并将其纳入指南推荐。最终,于2023年6月形成了指南的第一版并提交工作小组审核,随后在2023年9月形成了第二版并获得全体指南编写委员会专家的审核通过。最后,该指南于2024年1月经过指南编写委员会核心专家组的讨论后定稿。

(二)指南制订原则和证据等级分类

每个专题的专家对现有的指南和现有文献进行系统综述评价,完成推荐意见。每个专题包括推



荐意见支持相关意见的文献概述及其目前研究不足及其未来研究的内容。对有争议的推荐意见,提交证据水平小组,集中分析文献证据级别,确定推荐稿,征求全体专家组意见并修订。通过指南证据审查委员会对一个或多个关键问题进行系统审查和分析。征询广泛意见,对意见稿进行修改,形成终稿。

本指南按照《中国制订/修订临床诊疗指南的指导原则(2022版)》^[4],采用美国心脏病学会(ACC)/美国心脏协会(AHA)有关患者诊疗中的临床策略、干预、治疗或诊断试验的推荐类别和证据水平(2019更新)(表1)^[5]。推荐等级(COR)和证据水平(LOE)系统进行分类。COR表示推荐的强度,包括获益与风险比例的估计和确定性,LOE反映了相应支持证据的质量。由于中国人群和欧美等人群在颅内动脉瘤的临床特点、自然病史和临床预后上存在较大的差异,因此,在本指南中,为了使推荐意见能更好地符合临床实际情况,将推荐意见分为中国人群来源(CP)和其他人群来源(OP)。

二、aSAH的自然史和结局

推荐意见 1:对于 aSAH 患者,建议使用已验证

的临床量表,例如 Hunt-Hess 分级或世界神经外科学会联合会(WFNS)分级,以准确评估初始病情严重程度并预测其预后。(1级推荐,B-NR级证据,OP)

推荐意见 2:对于病情严重(高分级)的 aSAH 患者,在与家属详细交代预后后,可以考虑采用治疗动脉瘤的手段以期改善患者的预后。(2a级推荐,B-NR级证据,OP)

推荐意见 3:对于高龄的 aSAH 患者,在与家属详细交代预后后,可以考虑实施动脉瘤治疗以提升生存率和改善预后。(2a级推荐,B-NR级证据,OP)

推荐意见 4:对于 aSAH 患者,若在治疗之后生命体征仍不稳定,且存在不可逆神经损伤的明确证据,可以认为针对动脉瘤治疗是无效的。(3级推荐,无益,B-NR级证据,OP)

(一)证据概述

aSAH 的病死率高达 50%,总体预后差。Hunt-Hess 分级或 WFNS 分级可准确评估初始病情严重程度并预测其预后^[6-7]。

再出血是影响 aSAH 预后的一个关键因素,研究发现约 13.6% 的患者会发生再出血^[8]。在治疗策略上,aSAH 的治疗可分为超早期、早期和晚期治疗三种方式,其中早期治疗能显著提高患者的

表1 指南制订的推荐等级和证据等级分类^[5]

级别	详细说明
推荐等级	
1级(强) 获益>>>风险	指南中建议的用词,推荐;表明/有用/有效/有益的;应该执行/管理/其他;比较效果的用词(仅限于来自证据A或B的研究,直接比较不同治疗方式或策略);推荐治疗方式/策略A/优先于治疗B;应该选择治疗方式A而不是治疗B
2a(中等) 获益>>风险	指南中建议的用词,合理;可有用/可有效/可有益的;比较效果的用词(仅限于来自证据A或B,直接比较不同治疗方式或策略);治疗方式/策略A/可推荐或优先于治疗B;选择治疗A而不是治疗B是合理的
2b(低) 获益>风险	指南中建议的用词,可能合理的;可以考虑;有用性/有效性未知/不明确或不
3 无益(中等) (通常仅使用于证据A或B) 获益=风险	指南中建议的用词,不推荐;未指明/有用/有效/有益;不应该执行/管理/其他
3 有害(强) (通常仅使用于证据A或B) 风险>获益	指南中建议的用词,有潜在危害的;造成伤害;与致残率/死亡率高相关;不应该执行/管理/其他
证据水平(CP,证据来自中国人群;OP,证据来自其他人群)	
A级	来自1个或多个的RCT的高质量证据*;高质量RCT研究的荟萃分析;一个或多个经高质量登记研究证实的RCT试验
B级(B-R和B-NR级)	B-R,随机研究,来自1个或多个的RCT的中等质量证据*;中等质量RCT的荟萃分析。B-NR,非随机研究,来自1个或多个设计、执行良好的非随机研究、观察性研究或注册研究;这些研究的荟萃分析
C级(C-LD级和C-EO级)	C-LD,数据有限,设计或执行缺陷的随机或非随机观察性或注册研究;这些研究的荟萃分析;人体受试者生理或机制研究;C-EO,专家意见,基于临床经验的专家共识

注:推荐等级和证据水平独立确定的,任何等级可与任何证据相匹配;证据水平C的推荐并不意味着该建议强度低;指南中提到的许多重要临床问题不适合临床试验;虽然没有RCT研究,但是可能有一个非常明确的临床共识,特定的检验或治疗是有用或有效的;“评估研究质量的方法不断发展,包括应用标准化的、广泛使用的、最好是经过验证的证据等级工具;对于系统评价,成立证据审查委员会;RCT为随机对照试验

良好预后率^[9]。病情严重(高分级)或高龄的 aSAH 患者,在与家属详细交代预后后,可以考虑采用治疗动脉瘤的手段以期改善患者的预后^[6, 10-13]。对于 aSAH 患者,若生命体征不稳定,经治疗之后仍无明显好转,且存在不可逆神经损伤的明确证据,可以认为针对动脉瘤治疗是无效的^[14-15]。

尽管大约有 2/3 的存活患者能恢复独立生活,但许多患者在出院后仍面临长期的认知功能障碍问题,包括记忆力下降、语言问题和精神情绪障碍^[16-20]。这些发现提示,在临床治疗中应更加重视这部分患者的长期护理、认知评估康复。

(二)未来研究方向

在 aSAH 的研究中,多项临床指标如体质指数、高血压、高血糖及肌钙蛋白水平等与治疗结果密切相关,但其对预后和治疗效果的确切影响尚需进一步研究以明确。同时,新型生物标志物的探索,包括影像学、血清和脑脊液分析,结合蛋白组学和基因组学技术,是当前的研究热点。这些生物标志物的综合应用对于精确预测病情进展和指导治疗具有极大的潜力。此外,对于早期不可逆脑损伤的定义和评估,包括损伤的时间进程和严重性,目前还存在不确定性,需要更多的研究来阐明这些因素对 aSAH 治疗和预后的具体影响。

三、aSAH 的临床表现与诊断

推荐意见 5: 对于突发剧烈头痛患者,建议及时进行诊断性检查和评估,以诊断/排除 aSAH。(1 级推荐, B-NR 级证据, OP)

推荐意见 6: 对于突发剧烈头痛患者,若症状持续时间 ≥ 6 h 或出现新发神经功能障碍,应当进行头部 CT 平扫检查,如果 aSAH 阴性,则进行腰椎穿刺以诊断/排除 aSAH。(1 级推荐, B-NR 级证据, OP)

推荐意见 7: 对于突发剧烈头痛患者,若症状持续时间 < 6 h 且没有新发神经功能缺损,可以完善头部 CT 平扫,并由影像科医师或神经外科专科医师判读后诊断/排除 aSAH。(2a 级推荐, B-NR 级证据, OP)

推荐意见 8: 对于没有新发神经功能障碍的突发剧烈头痛患者,可使用渥太华 aSAH 规则鉴别高风险 aSAH 患者。(2b 级推荐, B-NR 级证据, OP)

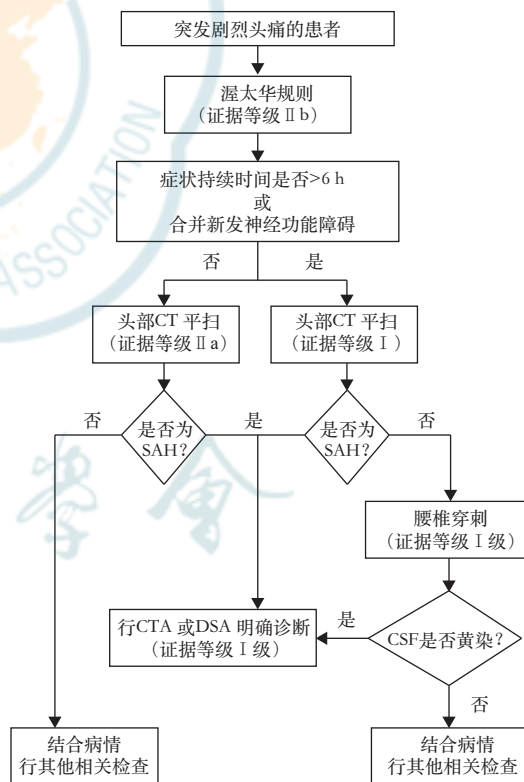
推荐意见 9: CT 血管造影(CTA)具有良好的灵敏度和特异度,可作为 aSAH 辅助检查的首选,但其对直径 < 3 mm 的颅内动脉瘤及其周围血管灵敏度不高,易漏诊。(2a 级推荐, B-NR 级证据, OP)

推荐意见 10: 数字减影血管造影(DSA)是诊断 aSAH 的“金标准”,且对最大直径 < 3 mm 的微小动脉瘤及其周围小血管的显影有更高的灵敏度,故对于 CTA 检查未明确 aSAH 病因的患者,推荐进行 DSA 检查。(2a 级推荐, B-NR 级证据, OP)

推荐意见 11: 对于确诊为动脉瘤破裂导致的蛛网膜下腔出血患者,DSA 可作为确定动脉瘤干预的最佳策略。(2a 级推荐, B-NR 级证据, OP)

(一)证据概述

面对一个突发剧烈头痛的患者时,医师首先应考虑是否为 aSAH 的可能性^[21-24]。aSAH 常伴有恶心、呕吐、畏光或颈强直等症状^[25]。而在出血发生前数天至数周,逐渐加重的前驱性头痛是不容忽视的预警信号^[26]。对于没有新发神经功能障碍的突发剧烈头痛患者,可使用渥太华 aSAH 规则鉴别高风险 aSAH 患者^[23, 27-28]。渥太华 aSAH 规则诊断的具体流程图如图 1 所示。



注:CT 为计算机断层扫描;SAH 为蛛网膜下腔出血;CTA 为计算机断层扫描血管造影;DSA 为数字减影血管造影;CSF 为脑脊液

图 1 渥太华动脉瘤性蛛网膜下腔出血规则诊断流程图

对于所有疑似 aSAH 的患者,早期进行 CT 平扫至关重要,尤其是在症状发作后 6 h 内。头颅 CT 可以提供关于出血量和分布的直接证据,有助于初步

定位潜在的破裂动脉瘤^[29-33]。

当初始 CT 扫描结果不明确或无法排除 aSAH 时,CTA 作为第二线诊断工具,可以提供动脉瘤大小和形态的详细信息。CTA 的优势在于速度快、广泛应用,且对大动脉瘤的检出率高。然而,对于 < 3 mm 的动脉瘤的灵敏度较低^[34-35]。同时建议在行 CTA 检查时可以同时进行 CT 灌注检查(CTP),有利于判断早期脑缺血状态及预测预后^[36]。如果 CTA 结果不确定或患者有更高风险的临床表现,则应考虑 DSA。DSA 是评估脑血管解剖结构的金标准,可用于确定动脉瘤干预的最佳策略,尤其是在评估小动脉瘤和复杂血管结构时,其灵敏度和特异度均优于 CTA^[37-40]。

在 CT 未能确诊 aSAH 的情况下,腰椎穿刺是确诊 aSAH 的重要辅助检查之一。通过检测脑脊液中是否有血液或含铁血黄素以明确有无 aSAH^[41-42]。

医师应根据患者的临床表现、病史以及初始检查结果来制定个体化的诊断流程。非典型表现如主要以颈痛、晕厥、癫痫发作或新发局部神经功能缺失的患者,即使 CT 未见 aSAH,也应进一步进行 CTA、DSA 或腰椎穿刺等检查^[43]。在确定诊断策略时,应考虑每种诊断工具的可获得性、灵敏度、特异度以及患者的整体状况。综合运用这些诊断工具和策略,可以帮助医师迅速、准确地诊断 aSAH,确保患者得到及时有效的治疗。

(二)未来研究方向

CTP 可以判断早期脑损伤以及脑缺血程度,为早期脑损伤治疗以及预测预后提供评估工具,建议对于 aSAH 患者早期进行多模态 CT 检查(包括平扫 CT+CTA+CTP)。MRI 在 aSAH 的检测中的重要性逐渐增大,需要对现有及新兴 MRI 序列的诊断准确性进行深入研究,低磁场可移动核磁在 aSAH 中的应用价值值得期待。同时,探索如双能量 CT (DECT)和单光子计数 CT(SPCCT)等新兴成像技术,为 aSAH 及其相关动脉瘤的检测提供新的可能性,预示着成像技术在提高诊断精度和疾病理解方面的重大进步。

四、aSAH 的术前管理

推荐意见 12: 应让患者卧床休息,保持大便通畅,监测出入量。(1 级推荐,C-EO 级证据,OP)

推荐意见 13: 对于剧烈头痛躁动患者应予以镇痛镇静治疗。(1 级推荐,C-EO 级证据,OP)

推荐意见 14: 应使用统一量表评估患者病情严重程度,若患者病情复杂或首诊医院不具备处理

条件时,应尽快转运至上级医院。(1 级推荐,B-NR 级证据,OP)

推荐意见 15: 对于格拉斯哥昏迷(GCS)评分 < 9 分、Hunt-Hess 分级 IV 级和 V 级、癫痫持续状态、 $PCO_2 > 60$ mmHg (1 mmHg=0.133 kPa)、呼吸频率 > 40 次/min、急性左心衰伴肺水肿的患者应行气管插管,保持呼吸道通畅。(1 级推荐,B-NR 级证据,OP)

推荐意见 16: 注意监测血压,应根据患者既往血压水平和病情制定个体化降压方案。(1 级推荐,B-NR 级证据,OP)

推荐意见 17: 对 GCS 评分 < 9 分、Hunt-Hess IV-V 级、III 级合并脑积水的患者应进行颅内压监测,颅内压应维持在 < 20 mmHg。(1 级推荐,B-NR 级证据,OP)

推荐意见 18: 建议结合多项指标进行血容量评估,其中最简单可靠的指标是出入量和患者的体征表现。(2a 级推荐,B-NR 级证据,OP)

推荐意见 19: 监测患者血红蛋白、电解质、血糖及体温,确保这些指标控制在正常范围之内是合理的;对于危重患者建议行心电监护及监测肌钙蛋白、脑利钠肽等指标。(2a 级推荐,B-NR 级证据,OP)

(一)证据概述

术前对于 aSHA 的管理,常规处置措施包括让患者卧床休息,避免外界刺激,并保持大便通畅^[44]。对于频繁呕吐的患者,适量给予止吐药物以缓解症状。此外,为了降低由于颅内压增高而导致的头痛和血压升高,需要进行镇痛治疗,首选药物为对乙酰氨基酚^[44]。对于情绪躁动的患者,适当使用镇静治疗,并保持气道畅通^[44-45]。

病情评估和转运是治疗的关键环节。应使用 GCS 和 Hunt-Hess 分级来评估病情的严重程度。复杂病例需转运至有丰富经验的中心进行治疗^[46-48]。对于 GCS < 9 分、Hunt-Hess 分级 IV 级和 V 级、癫痫持续状态、 PCO_2 超过 60 mmHg、呼吸频率超过 40 次/min、急性左心衰竭伴肺水肿,建议进行气管插管^[49-50]。

出血后监测是治疗中不可或缺的一部分。这包括监测基本生命体征、瞳孔变化和 GCS 评分的动态变化^[8, 51-53]。对于 GCS 评分 < 9 分、Hunt-Hess 评分 IV-V 级的患者,特别需要进行颅内压监测^[51, 54]。急诊入院时血红蛋白浓度升高是 aSAH 患者 90 d 预后不良的独立危险因素^[55-56]。此外,

还应监测血容量以避免过高或过低、血红蛋白水平(考虑到输血可能增加并发症风险)、电解质平衡(特别是血钠水平)、心脏功能(包括心肌缺血和心律失常)、血糖水平(避免高血糖和低血糖)以及体温(尤其对于实施亚低温治疗的患者)^[57-58]。对于危重患者建议行心电监护及监测肌钙蛋白、脑利钠肽等指标^[59-71]。

早期脑损伤(EBI)的识别和管理至关重要,EBI与氧化应激密切相关^[72],基于EBI指标建立的“TAPS”模型用于预测90 d结局^[73]。医师需监测病理生理学变化,包括脑缺血、脑水肿和炎症反应,以便及时进行适当的治疗^[74]。

(二)未来研究方向

目前对于aSAH患者的容量评估方式以及目标容量范围仍缺乏明确的标准。炎症反应在EBI的发生发展中起着重要作用,对于抗炎类药物,例如糖皮质激素的使用对于EBI治疗的安全性和有效性缺乏相应的研究。

五、预防aSAH后再出血的医学措施

推荐意见 20:为了预防aSAH患者再出血,应保持安静,尽量避免有创检查。(2a级推荐,C-EO级证据,OP)

推荐意见 21:为了预防再出血,应进行适当的镇痛和镇静。(2a级推荐,C-EO级证据,OP)

推荐意见 22:对于未行手术治疗的aSAH患者,建议定期监测血压并使用短效药物控制血压,避免严重的低血压、高血压和血压变异性。(1级推荐,C-EO级证据,OP)

推荐意见 23:轻/中度的高血压患者收缩压控制在160 mmHg以下是合理的。(2a级推荐,B-NR,OP)

推荐意见 24:目前不推荐通过药物减少再出血而改善预后。(3级推荐,无益,A级证据,OP)

推荐意见 25:抗纤维蛋白溶解药物(如氨甲环酸或氨基己酸)不能提高患者的总体预后。(3级推荐,无益,B-NR级证据,OP)

推荐意见 26:出血后可考虑短时间(<72 h)使用抗纤维蛋白溶解药物以降低早期再出血的发生概率,对于应用抗纤维蛋白溶解药物的患者建议进行深静脉血栓监测,以避免血栓事件的发生。(2a级推荐,B-NR级证据,OP)

推荐意见 27:在接受抗凝药物治疗的aSAH患者中,应使用适当的逆转药物进行紧急抗凝逆转,以防止再出血。(1级推荐,C-EO级证据,OP)

推荐意见 28:可以考虑将醋酸去氨加压素(DDAVP)作为aSAH患者紧急药物止血的一线治疗。(2b级推荐,B-NR级证据,OP)

推荐意见 29:除特殊临床情况下,目前尚无证据支持aSAH患者需要使用重组凝血因子VIIa预防再出血。(3级推荐,无益,C-EO级证据,OP)

(一)证据概述

为了防止aSAH后的再出血,应维持一个安静且低刺激的环境,同时避免进行有创的检查和操作。这有助于减少患者的压力和焦虑,从而降低再出血的风险^[44]。

镇痛和镇静治疗同样重要。适当的镇痛和镇静可以有效减少疼痛和焦虑,稳定血压,进而预防再出血^[44]。针对高血压的aSAH患者,应缓慢降低血压,同时注意防止血压降低过快而导致脑组织灌注不足。降压目标的确定需要根据患者的具体病史来综合评估,以避免血压的波动^[44]。合并轻/中度高血压的患者收缩压可控制在160 mmHg以下^[8, 51]。

药物治疗方面,aSAH后再出血的风险与动脉瘤内微环境中凝血和纤维蛋白溶解的平衡密切相关^[75-76]。药物治疗可降低再出血风险,但目前不推荐为了改善预后而使用药物降低再出血风险^[77-79]。对于高风险患者,短时间(<72 h)使用抗纤维蛋白溶解药物(如氨甲环酸或氨基己酸)可减少早期再出血的发生风险,同时不提高迟发性脑缺血的发生率,长时间(≥72 h)应用则可能增加血栓栓塞事件的发生(包括动脉血栓事件和深静脉血栓),准确的药物应用时间及药物剂量目前尚无统一标准^[77, 79-81]。然而,需要注意的是,这种治疗对总体预后并无显著益处^[44]。对于伴有心肌梗死、肺栓塞、凝血功能障碍及深静脉血栓的aSAH患者则不建议使用抗纤溶治疗。

对于使用抗凝药物的aSAH患者,进行紧急抗凝逆转能够降低再出血的风险。同时,DDAVP作为止血剂的使用,可以逆转由药物引起的血小板功能障碍,降低再出血的风险,从而改善神经功能预后^[44, 82-83]。

关于重组凝血因子VIIa的使用,虽然理论上可预防再出血,但目前尚无充分证据支持其在临床上的使用^[44]。一些研究表明,虽然使用后未发生再出血,但存在血栓形成的风险^[44],因此应在仔细权衡利弊后进行。

(二)未来研究方向

目前从出现症状到动脉瘤闭塞期间,缺乏最佳的血压管理方案。今后研究应进一步明确收缩压、平均动脉压,减少血压变异的范围。同时,目前对服用抗血小板药物患者的围手术期管理尚不明确。今后研究需要进一步明确紧急血小板功能改善的方案和意义。此外,DDAVP 是否可用于 aSAH 再出血的预防以及其安全性仍需要进一步临床试验证明。

六、破裂脑动脉瘤的手术治疗及血管内治疗方法

推荐意见 30: aSAH 患者应在出现症状后尽早进行手术闭塞破裂的动脉瘤,最好在发病 24 h 进行,以改善预后。(1 级推荐, B-NR 级证据, OP)

推荐意见 31: 对于 Hunt-Hess 分级 IV~V 级或 WFNS 分级 IV~V 级的患者,经重症监护治疗后,如果病情分级好转,建议尽快进行外科干预。(2a 级推荐, C-EO 级证据, OP)

推荐意见 32: 对于病情危急,如发生脑疝、颅内巨大血肿的患者,即使尚未行 DSA 确诊,也可在排除相关手术禁忌后,行急诊开颅探查,根据术中情况及 CTA 结果决定是否行去骨瓣减压术、动脉瘤夹闭术等。(1 级推荐, C-EO 级证据, OP)

推荐意见 33: 对于 aSAH 患者,初次治疗应完全闭塞破裂动脉瘤,以减少再出血和再治疗的风险。(1 级推荐, B-NR 级证据, OP)

推荐意见 34: 对于急性期无法通过夹闭或单纯弹簧圈栓塞完全闭塞破裂动脉瘤的 aSAH 患者,部分闭塞破裂部位以防止再出血,待患者病情平稳后再行治疗是合理的。(2a 级推荐, C-EO 级证据, OP)

推荐意见 35: 对于病情低分级(Hunt-Hess 分级 I~III 级或 WFNS 分级 I~III 级)前循环破裂动脉瘤(RIA)的患者,行外科夹闭与介入栓塞治疗均有益于患者(1 级推荐, A 级证据, OP),具体治疗方式的选择需综合考虑。(I 级推荐, C-EO 级证据, OP)

推荐意见 36: 对重症、老年、椎-基底动脉的破裂颅内动脉瘤患者,倾向于首选介入栓塞治疗。(1 级推荐, B-NR 级证据, OP)

推荐意见 37: 对于合并有明显占位效应的破裂颅内动脉瘤所致血肿(出血量 > 50 ml),尤其是 RIA 患者,推荐行开颅手术治疗。(1 级推荐, B-NR 级证据, OP)

推荐意见 38: 对于年轻、宽颈动脉瘤、动脉瘤

体发出分支血管、大脑中动脉分叉部位动脉瘤患者,可首选开颅夹闭,若患者存在合并血肿可同期开颅清除血肿。(2a 级推荐, B-NR 级证据, OP)

推荐意见 39: 若条件允许,对于复杂动脉瘤患者或后循环动脉瘤破裂合并血肿患者可考虑复合手术治疗。(2a 级推荐, C-LD 级证据, CP)

推荐意见 40: 对于因宽颈动脉瘤破裂而无法进行手术夹闭或单纯弹簧圈栓塞的 aSAH 患者,支架辅助栓塞或血流导向装置治疗可以降低再出血的风险。(2a 级推荐, C-LD 级证据, OP)

推荐意见 41: 对于血泡样动脉瘤破裂引起的 aSAH 患者,相较于弹簧圈栓塞或动脉瘤夹闭术,使用血流导向装置可能是一个有效的治疗方案。(2a 级推荐, C-LD 级证据, CP)

推荐意见 42: 对于囊状动脉瘤破裂引起的 aSAH 患者,可进行单纯弹簧圈栓塞或开颅夹闭,不建议支架或血流导向装置。(3 级推荐, 无益, B-NR 级证据, OP)

(一)证据概述

1. 处理时机:对于 aSAH 应尽量及时处理,最佳时间为发病后 24 h 内,早期手术有助于改善患者预后^[9, 84-89]。目前破裂颅内动脉瘤的外科治疗主要包括开颅手术治疗、血管内治疗及复合手术三种方式。研究显示,相较于中期(4~10 d)或晚期(11~14 d)手术,患者在出血发生后的最初 0~3 d 内接受手术,其病死率和功能障碍程度较低^[90]。这表明在出血后尽快进行手术可能会带来更好的治疗效果。有研究显示,与发病后超过 24 h 相比,24 h 内进行治疗的效果更佳^[91-92]。然而,目前的研究尚未证明在 24~72 h 之间进行治疗与 24 h 内治疗之间患者受益存在显著差异。

对于不同临床分级的治疗建议有所不同。例如,对于 Hunt-Hess 分级 IV 级的患者,当无明确的手术治疗指征时,应暂时进行保守治疗,待症状缓解病情稳定后再考虑手术干预。而对于 Hunt-Hess 分级 V 级的患者,则建议进行密切的生命体征监测和保守观察,手术对此类患者的获益较低^[44]。

在紧急情况下急诊手术可能是必要的(比如出现脑疝或颅内巨大血肿时)。即使未进行 DSA 确诊,在排除手术禁忌后,也可以考虑进行急诊开颅探查。具体手术方法可以根据术中探查结果或 CT、CTA 的结果来确定^[93-94]。

2. 外科治疗的目的及方式:aSAH 的外科治疗目的是使破裂的颅内动脉瘤完全闭塞。破裂动脉



瘤若未完全闭塞,再出血和再治疗的风险会显著增加。因此,治疗的目标是在条件允许的情况下实现完全闭塞^[95-97]。但对于多学科讨论后仍认为无法在急性期达到完全闭塞的患者,可考虑一期闭塞动脉瘤的破裂部位,以减少早期再出血的风险。在 1~3 个月内依据患者的功能状况和恢复情况,再行二期完全闭塞处理^[97]。

aSAH 外科治疗方式的选择应由具备介入治疗和开颅治疗能力的外科医师或团队进行综合评估。从治疗效果分析来看,既往的荟萃分析表明,相比于接受开颅夹闭的患者,接受介入栓塞治疗的患者术后一年内实现功能独立的可能性更高,但在长期功能预后上差异并不显著。国际颅内动脉瘤治疗试验(ISAT)和脑动脉瘤治疗随机试验(BRAT)的研究结果也表明,介入栓塞术和开颅夹闭术在病死率和功能预后上的差异不大^[98-99]。既往的经验显示,对于颈内动脉和后交通动脉动脉瘤患者,介入栓塞术效果更好,而对于破裂的大脑中动脉动脉瘤患者则夹闭术效果更佳。

3. 特殊情况处理:在治疗年龄超过 70 岁的老年患者时,尽管相关数据支持不足,但介入栓塞术通常是首选治疗方法^[98, 100-101]。然而国际蛛网膜下腔出血治疗研究(ISAT)显示,介入栓塞术不能使 70 岁以上的患者显著获益;对于 65 岁及以上的患者,治疗效果则取决于动脉瘤的位置^[99]。

对于年轻、宽颈动脉瘤、动脉瘤体发出分支血管、大脑中动脉分叉部位动脉瘤患者,可首选开颅夹闭,若患者存在合并血肿可同期开颅清除血肿^[102-103]。在 aSAH 伴有脑内大体积出血患者的治疗中,急诊开颅手术被视为一种可行的干预方法。根据一项小型随机对照试验的结果,急诊血肿清除术和动脉瘤夹闭术能显著降低病死率并改善功能预后。此外,由于开颅夹闭术患者复发率和破裂风险较低,通常被认为更适合年轻患者(年龄 < 50 岁)^[104-105]。

对于复杂动脉瘤的治疗,可能需要采用复合手术策略。在开颅夹闭术中,造影可以及时反映夹闭情况和穿支血管的通畅性。对于严重钙化的瘤颈,可能需要结合介入治疗^[106]。在进行载流动脉闭塞联合血运重建治疗时,球囊闭塞试验和详细造影评估对确保治疗安全和效果至关重要^[107-108]。

4. 手术材料选择:支架辅助弹簧圈栓塞和血流导向装置相较于单纯弹簧圈栓塞(包括球囊辅助技术)或动脉瘤夹闭术,有较高的并发症和再出血风

险^[109-110]。但在其他动脉瘤治疗方案不可行的情况下,它们可以有效栓塞动脉瘤以减少动脉瘤再次破裂出血风险^[111-112]。

血泡样动脉瘤是由动脉壁缺陷引起的假性动脉瘤,具有高破裂风险和高病死率^[113]。此类病变不适合传统的弹簧圈栓塞或动脉瘤夹闭术,而是需要更复杂的包裹或搭桥策略。小型回顾性荟萃分析表明,使用血流导向装置治疗血泡样动脉瘤可以降低并发症发生率和病死率^[113-114]。

在 aSAH 急性期,应避免使用支架或血流导向装置。支架辅助弹簧圈栓塞和血流导向装置的血栓形成风险高于单纯弹簧圈栓塞,因此术前术后均需双重抗血小板治疗,而双重抗血小板治疗与较高的出血性并发症风险相关^[110]。

(二)未来研究方向

尽管大量数据支持早期治疗动脉瘤以改善患者预后,但关于超早期治疗的具体时间窗定义尚不统一,今后的研究应关注这一点。对于高级别 aSAH 患者,实践中倾向于采用弹簧圈栓塞治疗,但由于缺乏可靠的数据比较其与血管夹闭手术的效果,目前还没有明确的基于循证医学的治疗指导建议。同时,新型血流导向技术如颅内血流导向装置减少了对抗血小板药物的依赖和并发症的风险,并显示对再出血有一定的保护作用,其可接受的结局支持了这些技术的应用,但是关于这些封堵器治疗破裂动脉瘤的比较数据和长期效果仍需进一步研究以提供明确的治疗指导。

七、aSAH 患者的术中麻醉管理

推荐意见 43: 对于 aSAH 患者,术中使用甘露醇或高渗盐水可有效降低颅内压和脑水肿。(2a 级推荐, B-R 级证据, OP)

推荐意见 44: 对于 aSAH 患者,麻醉目标应包括尽量减少术后疼痛、恶心和呕吐。(2a 级推荐, B-NR 级证据, CP)

推荐意见 45: 在 aSAH 患者中,动脉瘤术中预防高血糖和低血糖是合理的,可改善转归。(2a 级推荐, B-NR 级证据, OP)

推荐意见 46: 对于 aSAH 合并破裂动脉瘤的患者,术中频繁监测和控制血压是合理的,以防止缺血和再破裂。(2a 级推荐, C-LD 级证据, OP)

推荐意见 47: 对于 aSAH 患者,术中神经监测可合理指导麻醉和手术管理。(2b 级推荐, B-NR 级证据, OP)

推荐意见 48: 对于 aSAH 和术中突发的动脉瘤

破裂的患者,术中可使用腺苷诱导心脏短暂停搏,从而辅助动脉瘤的暴露和夹闭。(2b 级推荐,C-LD 级证据,OP)

推荐意见 49:在低 WFNS 评分的 aSAH 患者中,动脉瘤手术中常规使用亚低温并不能改善患者远期预后。(3 级推荐,无益,B-R 级证据,OP)

(一)证据概述

1. 术中麻醉管理:在 aSAH 的手术治疗中,术中麻醉管理是关键的一环。这包括高渗类药物的使用、术前血糖控制、术中容量状态和血压的监控、神经监测、腺苷诱导的心脏骤停以及亚低温治疗、术后恶心和呕吐的管理的应用。甘露醇和高渗盐水等高渗类药物,通常被用于处理脑肿胀和颅内压升高^[81, 115]。然而,这些药物也有潜在的不良反应:甘露醇可能导致低血容量和低血压,而高渗盐水可能引起血压升高^[116-117]。术前血糖控制对于 aSAH 患者至关重要。术前血糖控制不良的患者面临着较高的不良预后风险^[66, 118-120]。此外,有研究显示术中高血糖与术后认知和神经功能的下降相关^[121]。

2. 血压管理:对于血压的管理,术中需要频繁的血压监测和严格的血压控制,以防止脑缺血和动脉瘤再次破裂^[122]。如需快速降压时,腺苷诱导的心脏骤停可用于开颅手术中快速降低血压^[123-124]。尽管其具有快速起效和抵消的特性,但对于部分患者存在禁忌^[125]。此外,还应需要注意围手术期的容量状态,低容量状态可能诱发迟发性脑缺血(delayed cerebral ischemia, DCI),而高容量状态可能带来不良影响^[126-128]。一项回顾性观察研究,分析了 aSAH 患者术中低血压与术后发生主要心脏不良事件(major adverse cardiovascular events, MACE)之间的关系。该项研究发现平均动脉压(mean arterial pressure, MAP)在 85~65 mmHg 范围内,随着 MAP 降低,心血管风险几乎呈线性增加,在校正年龄 ≥ 70 岁、女性、改良 Fisher 分级 3~4 级、心血管疾病史、术前心肌酶升高因素后,发现 MACE 与 MAP < 75 mmHg(曲线下面积、持续时间和时间加权平均值)显著相关^[129]。

3. 术中神经监测:如使用脑电图、体感诱发电位和运动诱发电位,虽然缺乏前瞻性研究,但日益增多的证据支持其使用,以提高手术安全性^[130-135]。术中亚低温治疗的应用则是一个有争议的话题。虽然有研究提示术中亚低温治疗可能有益^[136-139],但一项随机对照试验发现,术中亚低温治疗与维持正常体温的患者在神经功能预后方面无显著差

异^[140]。因此,需要更多的研究来评估其有效性,同时复温策略也尚不明确^[141-144]。

4. 麻醉术后并发症:研究数据显示,开颅手术后 22%~70% 的患者会出现恶心和呕吐。为了管理这些症状,推荐使用多模式药物治疗方案,包括血清素拮抗剂和类固醇^[145]。此外,使用丙泊酚、减少麻醉药物量和维持良好的血容量状态也有助于预防术后恶心和呕吐^[146-148]。

(二)未来研究方向

目前缺乏 aSAH 患者的最佳术中麻醉管理策略,对于 aSAH 患者在手术过程中的最佳容量状态、血糖和电解质管理策略尚缺乏充分的研究支持。此外,关于麻醉药物预防脑血管痉挛(cerebrovascular spasm, CVS)和 DCI 的效果,以及氯胺酮对 DCI 相关脑梗死的影响和 β -肾上腺素受体阻滞剂对术后病死率的影响等方面,目前都缺乏充分的试验数据和长期影响的研究。

八、aSAH 的相关并发症的管理

推荐意见 50:对于机械通气时间 > 24 h 的 aSAH 患者,建议实行标准化的重症监护病房(ICU)组合式护理以缩短机械通气及医院获得性肺炎的持续时间。(1 级推荐,B-NR 级证据,OP)

推荐意见 51:对于发生急性呼吸窘迫综合征(ARDS)及危及生命的低氧血症的 aSAH 患者,在颅内压监测下行俯卧位和肺泡复张等抢救措施以改善患者氧合是合理的。(2b 级推荐,B-NR 级证据,OP)

推荐意见 52:对于 aSAH 患者,密切监测其容量状态以及目标导向治疗是维持正常血容量的合理方法。(2a 级推荐,B-R 级证据,OP)

推荐意见 53:对于 aSAH 患者,使用盐皮质激素治疗尿钠增多和低钠血症是合理的。(2a 级推荐,B-R 级证据,OP)

推荐意见 54:对于 aSAH 患者,由于高血容量会增加并发症的发生率,因此诱导高血容量是潜在的危险因素。(3 级推荐,有害,B-R 级证据,OP)

推荐意见 55:对于破裂动脉瘤已稳定的 aSAH 患者,建议行药物或机械预防以降低静脉血栓栓塞症(VTE)风险。(1 级推荐,C-LD 级证据,OP)

推荐意见 56:对于 aSAH 患者,控制血糖、严格管理高血糖以及避免低血糖能改善预后。(2a 级推荐,B-NR 级证据,OP)

推荐意见 57:对于对退热药不敏感的发热 aSAH 患者,急性期的治疗性体温管理有效性尚不



确定。(2b 级推荐, C-LD 级证据, OP)

(一) 证据概述

在 aSAH 患者中, ARDS 与预后不佳密切相关, 表现为较高的发病率, 与治疗强度增加和较长的 ICU 住院时间相关^[149-150]。为了应对这一挑战, 实施集束化护理对于脑损伤且需机械通气的患者, 包括 aSAH 患者, 是至关重要的。这种护理方法包括小潮气量通气、呼气末正压通气、早期肠内营养和抗生素治疗等措施, 可有效减少机械通气时间和 ICU 住院时间。针对 aSAH 患者的 ARDS 治疗措施, 如肺泡复张和俯卧位通气, 存在一定争议, 因为这些措施可能会升高颅内压。然而, 根据小型随机对照试验的数据, 这些治疗措施可以提高动脉氧分压, 而不会导致病理性颅内压升高^[151-154]。

在 aSAH 患者的治疗中, 循环容量监测也是一个关键因素。这些患者常合并高尿钠和低钠血症, 可能导致循环容量不足^[155-157]。因此, 建议通过持续监测和血流动力学参数来指导液体出入量和血流动力学管理^[158-160]。尽管氟氢可的松可改善高尿钠和低钠血症, 但对预后和 DCI 的发生率影响不大^[161-162]。

预防性诱导高容量血症的治疗策略并未改善总体结局或减少 DCI 事件, 反而增加了并发症的风险^[163-165]。另一方面, aSAH 患者中 VTE 的发生率较高, 目前药物预防 VTE 的安全性和有效性已得到临床试验的验证^[166-168]。

应当注意高血糖与不良预后相关, 但对于血糖控制的阈值和治疗方案存在争议。严格控制血糖可能导致低血糖和急性脑损伤^[66, 118, 169-170]。

在发热和体温管理方面, 发热与不良预后相关, 但目前的控制方法, 如药物治疗和物理降温均未能改善结局, 并可能伴随并发症^[171-172]。至于亚低温治疗, 虽在 aSAH 中显示出一定的临床可行性, 但对于减少炎症生物标志物方面的效果仍存在争议^[173]。

(二) 未来研究方向

1. aSAH 患者的输血和循环容量管理策略需明确: 在急性 aSAH 中, 虽然输血可能提高脑组织氧合, 但同时可能增加并发症和不良预后的风险^[174-175]。当前对于 aSAH 患者的血红蛋白阈值及输血指标尚存在不确定性^[65, 176-177]。同时, 关于确定 aSAH 患者最适宜的循环容量状态(如高容量或等容量状态)的方法和标准有待明确; 传统的测量方法可能与患者的低循环容量状态相关联。

2. 全身炎症、感染和发热管理的复杂性: aSAH 患者常伴有全身炎症反应综合征, 区分其感染性与非感染性原因尚存在数据不一致。同时, 感染并发症如肺炎和败血症在 aSAH 患者中不仅普遍存在, 而且会恶化患者的预后, 但其治疗对预后的影响尚不明确^[178-179]。同时, 炎症所诱发的脑损伤以及抗炎药物治疗的安全性和疗效都需要进一步的研究支持。此外, 发热和靶温管理在 aSAH 中的最佳实践仍存在研究空白。

3. 心脏并发症的管理和研究需求: 在 aSAH 后常见的心脏并发症, 如心律失常和心肌损伤, 对预后的影响目前主要关注于其预测价值^[180-181]。但关于这些心脏并发症的具体管理方法和其对患者总体预后的影响, 尚缺乏充分的研究和证据。

九、aSHA 的术后管理

(一) aSAH 患者术后的血压管理

推荐意见 58: 颅内动脉瘤术后, 推荐使用连续动脉血压监测或无创静脉血压监测患者收缩压。(2a 级推荐, B-NR 级证据, OP)

推荐意见 59: 颅内破裂动脉瘤术后应避免低血压(2a 级推荐, B-NR 级证据, OP)

推荐意见 60: 对合并高血压病的患者进行降压处理是合理的, 但对发生 CVS 或迟发性脑梗死的患者, 则不考虑降压治疗。(2a 级推荐, B-NR 级证据, OP)

证据概述: 对于 aSAH 术后患者应采用连续动脉血压或无创静脉血压监测^[182], 对于高血压患者应予以适当降压, 但需要将收缩压维持在适宜的范围内^[183]。对于合并有 CVS 或迟发性脑梗死的患者, 可能要停止使用降压药物^[184-185]。既往认为强化升压治疗可改善迟发性脑梗死的预后, 但研究显示强化升压与常规血压相比, 并未显著改善患者的预后, 反而可能增加心肺相关并发症的风险^[185-190]。

(二) CVS 和 DCI 的监测

推荐意见 61: 对于可疑血管痉挛或神经系统检查受限的 aSAH 患者, CTA 或 CTP 能够用于检测血管痉挛及预测 DCI 的发生。(2a 级推荐, B-NR 级证据, CP)

推荐意见 62: 经颅多普勒超声可能是检测血管痉挛及预测 DCI 的有效方法之一。(2a 级推荐, B-NR 级证据, OP)

推荐意见 63: 对于高级别 aSAH 的患者, 持续的脑电图检测可用于预测 DCI 的发生。(2a 级推荐, B-NR 级证据, CP)

推荐意见 64: 对于高级别 aSAH 患者,有创监测脑组织氧合、乳酸/丙酮酸比值以及谷氨酸可以用于预测 DCI。(2b 级推荐, B-NR 级证据, OP)

1. 证据概述: CVS 和 DCI 是 aSAH 的常见并发症,导致死亡和长期不良预后^[191]。DCI 定义为神经功能损害或 GCS 评分降低,持续 1 h 以上且非其他原因所致^[192]。DCI 在临床分级较差的患者中难以识别,通常由 CVS 引起^[193-194]。CVS 和 DCI 的病理生理学复杂,其机制尚未完全阐明^[122]。因此,了解它们的危险因素和标志物至关重要。目前的研究发现多种因素与 CVS 相关,如年龄、高血压等^[195-197]。

频繁的中枢神经系统检查对于发现 DCI 或脑梗死引起的新的神经功能缺损至关重要。任何神经系统检查结果的恶化均应进一步研究和干预,具体方法需根据患者的临床情况来决定。然而,单靠临床检查并不能发现所有的缺血事件,尤其是对于意识不佳、镇静和机械通气不良的患者。Aoki 等^[198]发现 MRI 在 23% 临床无症状的 aSAH 患者中检出脑梗死。此外,Al-Mufti 等^[199]称,脑部 CT 扫描在 20% 的 aSAH 患者中确定了无症状性梗死。因此,即使没有 DCI 的临床证据, aSAH 患者在高危期(4~14 d)也应定期进行完善影像学检查及生理学监测。可完善的影像学检查包括 DSA、CTA、CTP 和 MR 血管造影(MRA),以诊断、评估 CVS 和 DCI 的严重程度、部位和并发症^[200-205]。除了影像学监测之外,生理学监测也是 CVS 和 DCI 的重要监测方式,包括经颅多普勒超声(TCD)、脑电图、脑组织氧监测、脑微透析、脑血流热扩散(TD-CBF)监测、近红外光谱^[206-218]。

2. 未来研究方向:经颅多普勒监测、连续脑电图监测、侵入性多模态神经监测、皮质脑电图和血流监测是评估和管理急性 aSAH 的关键技术。尽管这些技术对于疾病管理至关重要,但目前的研究证据尚不足以明确它们对于长期临床预后的具体影响。因此,迫切需要进一步的研究来确定这些监测技术的标准化参数,并评估它们如何影响治疗决策。

(三) CVS 和 DCI 的治疗

推荐意见 65: 对于 aSAH 患者,早期使用尼莫地平有助于预防 DCI 及改善功能预后。(1 级推荐, A 级证据, OP)

推荐意见 66: 对于 aSAH 患者,维持正常血容量有助于预防 DCI 和改善功能预后。(2a 级推荐, B-NR 级证据, OP)

推荐意见 67: 对于出现症状性血管痉挛的 aSAH 患者,适当提升收缩压(诱导性高血压)可有效延缓缺血性脑损伤的发展并降低其严重程度。(2b 级推荐, B-NR 级证据, OP)

推荐意见 68: 对于出现严重血管痉挛的 aSAH 患者,使用血管扩张剂有助于逆转脑血管痉挛,延缓 DCI 的进展并降低其严重程度。(2b 级推荐, B-NR 级证据, OP)

推荐意见 69: 对于出现严重血管痉挛的 aSAH 患者,脑血管成形术有助于逆转 CVS,延缓 DCI 的进展并降低其严重程度。(2b 级推荐, B-NR 级证据, OP)

推荐意见 70: 对于 aSAH 患者,不建议常规使用他汀类药物以改善预后。(3 级推荐, 无益, A 级证据, CP)

推荐意见 71: 对于 aSAH 患者,不建议常规静脉使用镁以改善神经系统预后。(3 级推荐, 无益, A 级证据, OP)

推荐意见 72: 对于有 DCI 风险的 aSAH 患者,不应行预防性增强血流动力学(3H 治疗),以降低医源性损伤。(3 级推荐, 无益, B-R 级证据, OP)

1. 证据概述:对于 DCI 目前治疗的选择有限^[219-225]。对于有 DCI 风险的 aSAH 患者,不应行预防性增强血流动力学,以降低医源性损伤^[163, 226-228]。不建议常规使用他汀类药物和镁预防^[229-232]。尼莫地平是唯一被 AHA、美国神经重症监护学会(NCS)和欧洲指南推荐的药物,可改善低级别 aSAH 患者的预后。尼莫地平的作用机制包括增加纤溶活性和减少脑缺血后的钙内流,可能对 aSAH 患者有神经保护作用。尼莫地平的剂量和使用方式因患者情况而异,与血流动力学稳定性相关。英国动脉瘤尼莫地平试验表明,口服尼莫地平(60 mg, 每 4 小时 1 次, 21 d)耐受性好,可降低脑梗死和死亡风险。目前,该方案被推荐并广泛使用^[233-236]。对于出现严重血管痉挛的 aSAH 患者,脑血管成形术有助于逆转 CVS,延缓 DCI 的进展并降低其严重程度^[237-245]。

2. 未来研究方向:探索 DCI 的发生机制、风险分层以及治疗策略,包括评估联合治疗方法(如多联疗法、动脉内药物治疗和新型血管成形术)的效果,目前仍是 CVS 和 DCI 研究的重点。神经节阻滞、抗血小板和抗凝药物在预防 DCI 中的作用还需要更多的研究来明确。血红素降解产物和各种血管扩张剂在治疗中展现出潜力,但它们在 aSAH 患者中的有效性仍需进一步验证。蛛网膜下腔纤溶和痉挛解除药物的使用,作为一个新兴领域,正通



过双盲临床试验评估其治疗效果。

(四)aSAH患者脑脊液引流/分流的管理

推荐意见 73: 对于 aSAH 患者, 术后采用腰椎穿刺外引流或脑室穿刺外引流促进排出血性脑脊液可能有助于改善患者预后, 对于接受抗血小板治疗的患者, 腰椎穿刺所造成的术后出血概率要低于脑室穿刺, 对于治疗情况不同的患者, 需根据患者病情决定具体治疗方式。(2b 级推荐, B-NR 级证据, OP)

推荐意见 74: 对于合并急性症状性脑积水的 aSAH 患者, 应进行脑室外引流(EVD)以改善神经功能预后。(1 级推荐, B-NR 级证据, OP)

推荐意见 75: 对于需要 EVD 合并脑积水的 aSAH 患者, 建议遵循 EVD 方案以降低并发症及感染的发生。(1 级推荐, B-NR 级证据, OP)

推荐意见 76: 对于合并慢性症状性脑积水的 aSAH 患者, 建议行永久 EVD 以改善神经功能预后。(1 级推荐, B-NR 级证据, CP)

推荐意见 77: 对于 aSAH 患者, 终板造瘘不适用于降低分流装置依赖性脑积水的发生率。(3 级推荐, 无益, C-LD 级证据, OP)

1. 证据概述: 脑内血肿或脑室出血常见于重症 aSAH 患者。研究表明, 引流血性脑脊液有助于促进患者的康复, 并能改善预后^[246-247]。虽然脑室穿刺可能造成二次出血, 加重患者病情, 但当前的研究结果普遍显示, 对于那些未经抗血小板药物治疗的患者, 脑室穿刺引流并不会明显增加手术后出血的风险。然而, 对于介入手术后接受双联抗血小板治疗的患者, 脑室穿刺后的继发性出血风险确实有所提高^[248]。在持续脑室引流期间, 脑室内注射纤维蛋白溶解药物有助于改善患者的预后, 但这一做法仍需通过高质量的临床证据进一步证实^[249]。与持续脑室外引流相比, 持续腰椎外引流在穿刺出血、感染等方面均优于脑室穿刺外引流, 特别对于接受双抗血小板治疗的介入治疗患者, 腰椎外引流可以作为更好的选择^[248, 250-251]。当患者恢复后需要拔除引流管时候, 目前研究认为直接拔除引流管并不比分期夹闭拔除引流管引起更多的并发症^[252-253]。

对于 aSAH 术后脑积水, 目前临床上通常采用分流手术治疗(包括脑室腹腔分流术及腰大池腹腔分流术等)^[254-258]。对于合并慢性症状性脑积水的 aSAH 患者, 建议行永久 EVD 以改善神经功能预后^[259-262]。终板造瘘不适用于降低分流装置依赖性

脑积水的发生率^[263]。研究显示, 存在几个风险因素与患者术后需要接受分流手术的可能性增加有关, 这些因素包括患者年龄超过 60 岁、合并后循环动脉瘤、高 Hunt-Hess 分级、Fisher 评分 3 分以上、脑室内出血、术后再次出血以及颅内感染^[264-270]。

2. 未来研究方向: 腰大池引流或 EVD 可以加速脑脊液中血液产物的清除, 有助于减少 DCI 的发生。但是, 关于其在 aSAH 中的作用和效果的研究仍在进行中。对于无脑积水的高级别 aSAH 患者, 颅内压监测的益处数据有限。针对急性脑积水的治疗, 关于连续性与间歇性脑脊液引流的管理策略, 以及通过外侧脑室引流或腰管引流所设定的日引流量的数据仍然不充分。同时, 治疗动脉瘤破裂前急性脑积水是否增加再出血风险的确定性不高, 需要进一步研究。

(五)aSAH相关癫痫的管理

推荐意见 78: 对于伴有神经系统检测结果波动明显的/抑郁状态/大脑中动脉动脉瘤破裂/高级别 aSAH/脑积水/脑皮质梗死的 aSAH 患者, 持续脑电图监测用于检测癫痫发作是合理的。(2a 级推荐, B-NR 级证据, OP)

推荐意见 79: 对于合并癫痫发作危险因素的 aSAH 患者(例如大脑中动脉动脉瘤破裂、高级别 aSAH、脑出血、脑积水以及脑皮质梗死), 预防性使用抗癫痫药物有助于预防癫痫发作。(2b 级推荐, B-NR 级证据, CP)

推荐意见 80: 对于未合并癫痫发作危险因素的 aSAH 患者(例如大脑中动脉动脉瘤破裂、高级别 aSAH、脑出血、脑积水以及脑皮质梗死), 预防性使用抗癫痫药物不能获益。(3 级推荐, 无益, B-R 级证据, OP)

推荐意见 81: 对于 aSAH 患者, 苯妥英钠用于癫痫的预防和治疗会增加并发症发生率及病死率。(3 级推荐, 有害, B-NR 级证据, CP)

推荐意见 82: 出现癫痫发作的 aSAH 患者, 抗癫痫药物治疗时间 ≤ 7 d 能够减少围手术期癫痫发作相关并发症的发生。(2a 级推荐, B-NR 级证据, OP)

推荐意见 83: 对于出现癫痫发作且既往无癫痫发作史的 aSAH 患者, 超过 7 d 的抗癫痫药物治疗无法降低未来 aSAH 相关癫痫发作风险。(3 级推荐, 无益, B-NR 级证据, CP)

1. 证据概述: 癫痫是 aSAH 患者常见的严重并发症, 其中非惊厥性癫痫持续状态与不良预后相关, 需在严密监测基础上积极治疗。有研究指出持



续动态脑电监测能及时识别癫痫亚临床发作,并可能预测 DCI 的发生,但其准确性和评估预后的价值仍有待前瞻性随机对照试验进一步验证^[271-273]。aSAH 患者院前癫痫发作的比例为 17.9%,院内发作占 4.1%,术后即刻发作的发生率约为 2.3%,迟发性癫痫的发生率约为 5.5%。手术夹闭的患者其癫痫发生率(13.6%)显著高于血管内弹簧栓塞治疗组(8.3%)^[274-276]。癫痫可能发生在 aSAH 手术的数年之后,因而规律复查监测对于此类患者尤为重要,此外,对于这类患者来说,预防性使用抗癫痫药物尚未显示出明显效果^[277-280],而且可能引发不同程度的药物不良反应,如苯妥英钠增加并发症发生率及病死率^[281-285]。因此,在考虑使用预防性抗癫痫药物时,必须仔细权衡其潜在益处与风险。对于合并癫痫发作危险因素的 aSAH 患者(例如大脑中动脉瘤破裂、高级别 aSAH、脑出血、脑积水以及脑皮质梗死),预防性使用抗癫痫药物有助于预防癫痫发作^[276, 281-282, 284, 286-289]。未合并危险因素的患者不推荐预防性使用抗癫痫药物^[268]。对于出现癫痫发作的 aSAH 患者,抗癫痫药物治疗时间 ≤ 7 d 能够减少围手术期癫痫发作相关并发症的发生^[276, 290-291]。如既往无癫痫发作史,超过 7 d 的抗癫痫药物治疗无法降低癫痫发作风险^[276, 281-282]。

2. 未来研究方向:抗癫痫药物在处理 aSAH 相关癫痫患者的预后中的作用,尤其是在有针对性且时间有限的给药方案下尚不明确。新一代抗癫痫药物虽然不良反应发生率低,但缺乏随机对照试验的证据支持其常规使用的益处。使用传统抗癫痫药物如苯妥英钠进行预防的相关发病率已得到充分记录,这对于了解癫痫对 aSAH 患者预后的实际影响至关重要。因此,进行随机对照研究以评估现代抗癫痫药物在治疗 aSAH 患者中的效果,对于指导最佳管理策略非常重要。

(六) aSAH 患者术后抗血小板药物的应用

推荐意见 84: 对于 aSAH 开颅术后患者,应用抗血小板药物预防缺血性事件是合理的。(2b 级推荐, B-NR 级证据, OP)

推荐意见 85: 接受血管内介入治疗的患者需根据患者具体情况调整抗血小板药物的使用。(2a 级推荐, B-NR 级证据, OP)

证据概述: 临床研究显示,术后应用抗血小板药物能够降低症状性 CVS 和 DCI 的发生率,而相关的再出血事件并未表现出明显升高,这一发现显著降低了因 CVS 引起的并发症以及总体病死

率^[292-293]。接受血管内介入治疗的患者需根据患者具体情况调整抗血小板药物的使用^[294]。

(七) 护理

推荐意见 86: 对于 aSAH 患者,建议使用基于循证医学证据的护理方案以提高护理的标准化。(1 级推荐, B-R 级证据, CP)

推荐意见 87: 对于 aSAH 患者,建议使用神经系统评估工具,例如 GCS 评分或国立卫生研究院卒中量表(NIHSS)进行评估,以监测 DCI 以及其他并发症。(1 级推荐, B-NR 级证据, OP)

推荐意见 88: 对于 aSAH 患者,建议频繁监测生命体征及其神经功能,以预防继发性脑损伤及不良预后。(1 级推荐, B-NR 级证据, OP)

推荐意见 89: 对于 aSAH 患者,在患者开始经口服药前对其进行吞咽功能的筛查以减少肺炎的发生率。(1 级推荐, B-NR 级证据, CP)

推荐意见 90: 对于 aSAH 患者,专业的卒中护理能力能够对预后、护理的及时性以及对卒中管理方案的遵循产生积极的影响。(2a 级推荐, C-LD 级证据, OP)

推荐意见 91: 对于动脉瘤已稳定的 aSAH 患者,早期的基于循证医学证据的活动方案对于改善出院时患者的功能水平以及 12 个月的整体功能预后有积极的作用。(2a 级推荐, C-LD 级证据, OP)

1. 证据概述: aSAH 和卒中患者的护理工作中,统一和标准化的护理方案被证实可以降低住院时间,减少再发性缺血性脑卒中的发生率,并改善患者 90 d 后的功能结局^[295-297]。这种方法的效果在蛛网膜下腔出血后控制性降糖试验中得到了明确的证明,这项大型观察性研究发现,护士引导的干预组与对照组相比,在 90 d 时的死亡率和依赖度有显著改善^[298-299]。

在术后的治疗和护理过程中,神经功能评估对于预防 DCI 相关的继发性损害至关重要^[297, 299-302]。例如,术后护理中识别 DCI 的风险因素,护理人员需要熟练掌握动脉瘤的大小和位置、Fisher 评分、GCS 评分等 DCI 风险的预测因素^[211, 303-305]。值得注意的是,评估的时间和持续时间在不同患者和情况中可能存在差异。此外,神经源性吞咽障碍是卒中患者常见的并发症,高达 65% 的患者在急性期会发展为吞咽障碍。因此,护士对吞咽困难的评估对于预防肺炎和降低病死率极其重要^[306-309]。经验丰富的护理人员对卒中护理方案的实施至关重要,通过培训提高护理人员对卒中指南的知识和依从性



对改善患者预后具有显著影响^[310-312]。对于动脉瘤已稳定的 aSAH 患者,早期的基于循证医学证据的活动方案对于改善出院时患者的功能水平以及 12 个月的整体功能预后具有积极的作用^[313-316]。

2. 未来研究方向:目前文献在探讨护理活动(如护理措施、生命体征和神经系统评估方案以及多模态监测)对预防并发症或改善长期结果影响方面的资料有限。尽管认为优化这些活动并考虑其时机是有益的,但缺乏大规模随机对照试验或荟萃分析来评估这些措施对特定患者群体的长期结果。对于某些患者,如颅内压增加或血流动力学不稳定的患者,这些活动可能受限或带来潜在的负面影响。同时,缺乏经过验证的工具来评估频繁的生命体征和神经检查对患者睡眠中断的影响。因此,未来研究集中护理干预的影响以及对风险和效益的综合评估将是具有价值的。

十、aSAH 患者的康复

推荐意见 92:对于没有医疗或神经系统禁忌证的 aSAH 患者,根据患者病情开展早期康复治疗能够改善患者功能预后。(2a 级推荐, B-NR 级证据, OP)

推荐意见 93:康复治疗联合高压氧治疗能够改善患者远期预后(2b 级推荐, C-LD 级证据, OP)

推荐意见 94:对于 aSAH 患者除了功能康复以外还需注重患者心理、认知方面的治疗(2b 级推荐, C-LD 级证据, OP)

推荐意见 95:对于 aSAH 患者,建议在出院前采用经过验证的评级量表或患者自述结果测评,以筛查其在身体、认知、行为以及生活质量方面可能存在的缺陷。(2a 级推荐, B-NR 级证据, OP)

推荐意见 96:对于 aSAH 患者,建议在急性期后使用经过验证的筛查工具来识别 aSAH 后的抑郁和焦虑。(2a 级推荐, B-NR 级证据, OP)

推荐意见 97:对于 aSAH 和抑郁症患者,建议采用心理治疗和药物治疗来减轻抑郁症状。(2a 级推荐, B-NR 级证据, OP)

推荐意见 98:在 aSAH 患者中,在急性期后使用经过验证的筛查工具有助于识别认知功能障碍。(2a 级推荐, B-NR 级证据, OP)

推荐意见 99:对于 aSAH 患者,建议采用早期多学科团队治疗和康复方法,旨在缩短住院时间并明确出院需求。(2a 级推荐, B-NR 级证据, OP)

推荐意见 100:在无抑郁的 aSAH 患者中,氟西汀治疗不能有效改善脑卒中后功能状态。(3 级推荐, 无益, A 级证据, OP)

推荐意见 101:对于成年 aSAH 患者,推荐对抑郁、焦虑和性功能障碍进行筛查和干预,以改善长期预后。(2a 级推荐, B-NR 级证据, OP)

推荐意见 102:在 aSAH 患者中,选择蒙特利尔认知评估(MoCA)而不是简易心智状态检查(MMSE)来识别认知障碍更为适宜。(2a 级推荐, B-NR 级证据, OP)

推荐意见 103:在 aSAH 患者中,对患者和护理人员进行长期认知功能障碍高风险的咨询有助于确定长期需求。(2b 级推荐, B-NR 级证据, OP)

(一) 证据概述

针对 aSAH 患者的早期恢复,康复治疗是促进功能恢复,改善 aSAH 的临床预后的重要手段^[317-322]。一项关于 aSAH 后早期活动的安全性和可行性的小样本单中心回顾性研究结果,证实了 aSAH 患者早期活动的安全性和有效性^[323]。针对急性 aSAH 后的早期康复前瞻性观察研究表明,在密切监护下,动脉瘤术后的第 1 天开始康复治疗是可行的,康复的内容需要根据患者的临床情况进行动态调整^[324]。随后一项关于 aSAH 术后早期康复治疗的前瞻性干预性研究证实,早期康复治疗是安全有效的,早期及较高强度的活动与术后并发症无关,且早期康复可降低 CVS 的发生率及严重程度^[314]。就长期预后而言,另一项前瞻性、对照及干预研究表明早期康复治疗可能改善高级别 aSAH 的预后^[319]。一项系列病例研究还发现,结合高压氧治疗的康复治疗能够改善患者在 aSAH 后 6 个月的预后^[325]。

对于 aSAH 患者的长期康复来说,长期的功能障碍可能引发并加剧 aSAH 心理、认知及精神方面的障碍^[326-329]。在 aSAH 急性期后使用经过验证的筛查工具识别焦虑、抑郁、认知功能障碍和性功能障碍,有助于改善长期预后,包括 MoCA 及 MMSE^[330-338],且研究表明 MoCA 较 MMSE 识别认知障碍更敏感^[335, 339-340]。

aSAH 患者的长期康复除了功能方面的训练以外还需注重对于患者心理、认知以及精神方面的长期评估和治疗。研究显示约 50% 的 aSAH 患者一年内会出现认知困难^[330]。尽管观察性队列研究使用了多种量表,而且使用这些量表的时间也不尽相同,但依然建议在患者出院前和出院后采用经过验证的评级量表或根据患者自述的结果对其进行对机躯体、认知、行为、生活质量以及抑郁和焦虑筛查,以了解最初动脉瘤破裂和 DCI 造成的损伤及可

能存在的缺陷^[330, 332, 341-346]。对于合并抑郁症的患者,建议采用心理治疗和药物治疗来减轻抑郁症状,如氟西汀等,但氟西汀治疗不能有效改善无抑郁患者卒中后功能状态^[330-331, 347-353]。以多学科团队为基础的治疗和康复方法可以缩短患者住院时间,改善患者预后^[332-336]。因此针对引起认知功能障碍的长期性高风险因素进行确定,有利于针对相应风险采取措施,从而预防 aSAH 患者出现认知障碍^[354]。

(二)未来研究方向

对于高级别 aSAH 的患者,需要进一步研究昏迷科学以及促进意识恢复的策略。对于 aSAH 患者心理及认知方面的治疗仍缺乏标准,包括治疗开始时间、评估方式、治疗方案。今后需要进一步完善患者心理、认知方面的研究。

十一、aSAH 患者的随访计划和预后评估

推荐意见 104: 对于治疗的 aSAH 患者,围手术期与随访时期行脑血管影像检查可用于评估动脉瘤残留或复发情况。(1 级推荐, B-NR 级证据, OP)

推荐意见 105: 出院后需定期对患者的功能、情绪、认知、行为等状态进行多维度评估。(1 级推荐, B-NR 级证据, OP)

推荐意见 106: 在 aSAH 患者中,对于单发动脉瘤,术后一定时间内应行 CTA 成像观察动脉瘤有无复发;对于多发动脉瘤,除观察经手术治疗后动脉瘤的情况,还应观察未经处理的动脉瘤的发展与变化。(1 级证据, B-NR 级证据, OP)

(一)证据概述

影像学随访是 aSAH 的随访计划和预后评估中重要的一部分,可用于评估动脉瘤残留或复发情况^[99, 105, 275]。影像学随访的方法多样,包括 CT 平扫、DSA、CTA 和 CTP。CT 平扫是最简易的影像随访方式,主要用于评估脑缺血病灶恢复和脑水肿的减退情况。而 DSA 被认为是颅内动脉瘤评估的“金标准”,能够准确地获取动脉瘤及载瘤动脉的结构信息。CTA 则以其快速、经济、无创的特点,在检测颅内动脉瘤方面显示出高灵敏度和特异度^[34]。CTP 则适用于评估 aSAH 患者的脑灌注状态,有助于评估 DCI^[355]。对于单发动脉瘤,术后一定时间内应行 CTA 成像观察动脉瘤有无复发;对于多发动脉瘤,除观察经手术治疗后动脉瘤的情况,还应观察未经处理的动脉瘤的发展与变化^[99, 105]。

影像学复查的时间分为短期和长期两种。短期复查通常建议在患者出院后的 3 个月和 6 个月进

行,而长期复查则是在出院后的 5 年内每年进行一次,之后每 3~5 年进行一次。

除了影像学随访,预后评估也是 aSAH 管理中的一个重要方面。功能、认知和行为障碍在 aSAH 患者中普遍存在,如抑郁症和认知功能障碍^[326-329, 337]。MoCA 评分等工具常用于评价认知功能,有助于提示远期不良预后^[20, 356]。而主流的研究通常使用 GCS 评分或改良 Rankin(mRS 量表)评分作为研究终点,尽管这些研究在随访时间上存在异质性。

(二)未来研究方向

例如 ISAT 这样的大型试验表明,治疗动脉瘤后存在再出血的风险,且有些未完全治疗的动脉瘤可能倾向于再次破裂。然而,关于术后影像如何影响再治疗或再出血风险的相关数据仍然较为缺乏。治疗后的破裂动脉瘤在 5 年后复发出血的风险依然存在,但目前尚未确定最佳的随访影像学检查时机及其持续时间。今后需对这些问题进一步研究。

十二、特殊颅内动脉瘤的管理和治疗

(一)多发破裂颅内动脉瘤的管理和治疗

推荐意见 107: 同期处理多个动脉瘤的手术风险明显高于处理单个动脉瘤,对于可以判断责任病灶的多发动脉瘤患者,建议分期处理。(2a 级推荐, B-NR 级证据, OP)

推荐意见 108: 介入栓塞术的动脉瘤闭塞率不及开颅夹闭术,但创伤小、恢复快且严重并发症少,适合在多发破裂颅内动脉瘤时首选。开颅夹闭术适用于处理出血量大、合并血肿、血管严重痉挛及动脉瘤位置便于夹闭的患者。(2a 级推荐, B-NR 级证据, OP)

证据概述: 多发性颅内动脉瘤的破裂风险与其发生机制紧密相关,包括性别、年龄、动脉压、吸烟习惯以及家族史等因素^[357-359]。相较于单发性动脉瘤,这类患者的动脉瘤破裂可能性通常更高^[357, 360-361]。在处理多发颅内动脉瘤时,判断哪个动脉瘤为破裂的责任病灶至关重要。动脉瘤的特征,如大小、形态和分叶状结构,以及局部血管的痉挛程度都是判断的重要依据^[362-363]。

手术时机的选择,如一期或分期手术,对于治疗多发性颅内动脉瘤的患者尤为重要。由于多发破裂颅内动脉瘤患者术后再次破裂的风险相对较高,一般建议在能够准确判断责任病灶的情况下避免同期手术处理多个动脉瘤^[357, 364]。在特殊情况下,可能需要同时处理所有潜在的危险动脉瘤^[365]。

关于手术方法的选择,无论是介入栓塞还是开颅夹闭,各自均有其特定的适应证。开颅夹闭手术在治疗多发性颅内动脉瘤方面,已被证实是一种安全且有效的策略^[366]。然而,对于多发性动脉瘤患者,介入栓塞手术由于其微创性、快速恢复以及较低的并发症风险等优势被认为是首选方法,特别是在患者有较多出血或伴有严重的血肿、血管痉挛时更是如此^[366-368]。

(二) 复发破裂颅内动脉瘤的管理和治疗

推荐意见 109: 治疗复发破裂动脉瘤可通过弹簧圈栓塞或手术夹闭。应根据具体情况决定手术方式。(2a 级推荐, B-NR 级证据, OP)

推荐意见 110: 对于采用血管内治疗的复发动脉瘤患者,根据动脉瘤具体情况,可以采用支架辅助的弹簧圈栓塞治疗。(2a 级推荐, B-NR 级证据, OP)

证据概述: 复发破裂颅内动脉瘤是在影像学上显示动脉瘤增大或新生显影后发生破裂^[368]。所有动脉瘤治疗后都可能复发破裂,平均复发时间为 12.9 年^[369]。复发率与动脉瘤破裂或未破裂状态有关^[370]。研究显示,复发破裂多发生在前循环,常因动脉瘤夹移位或弹簧圈问题导致^[371]。复发破裂风险与动脉瘤闭塞程度密切相关,完全闭塞后风险最低^[95]。弹簧圈栓塞治疗后复发再出血的风险高于手术夹闭^[95]。ISAT 研究表明,首次破裂后的复发破裂通常导致较差的临床结果,栓塞治疗组的复发出血多发生在首次术后 2~5 年,而夹闭组则在 4~7 年后^[102]。

治疗复发破裂动脉瘤可通过弹簧圈栓塞或手术夹闭^[368]。复发性动脉瘤通常解剖形状不规则,增加了再次手术的难度^[368]。对于复发破裂后的部分动脉瘤,可以采用支架辅助的弹簧圈栓塞治疗,这种方法已被证实是既安全又有效的治疗手段^[372]。

(三) 合并有脑血管狭窄的破裂颅内动脉瘤的管理和治疗

推荐意见 111: 对于合并脑血管狭窄的 aSAH 患者,推荐暂停抗血小板、抗凝药物后尽早行病因治疗,可降低再次破裂出血的风险。(2a 级推荐, B-NR 级证据, CP)

推荐意见 112: 对于合并血管狭窄的 aSAH 患者,血压过低会增加继发性脑缺血的风险。围手术期应当特别注意患者血压管理,保证脑组织灌注。(2a 级推荐, B-NR 级证据, OP)

1. 证据概述: 对于伴有脑血管狭窄的急性蛛网膜下腔出血患者,目前还没有统一的治疗标准。在临床治疗中,需要特别注意以下三个方面: (1) 抗血小板/抗凝药物的使用: 对于这类患者,建议停用抗血小板和抗凝药物,以降低再次出血的风险^[373]。在迅速完成病因诊治后,应尽早恢复这些药物的使用,以预防缺血性事件的发生^[373]。(2) 围手术期血压管理: aSAH 患者的再出血风险与高血压(收缩压超过 160 mmHg)密切相关^[374]。然而,对于合并血管狭窄的患者,过低的血压可能增加继发性脑缺血的风险。因此,对这类患者的围手术期血压管理尤为重要,务必确保脑组织的充分灌注^[375]。由于缺乏高质量的临床研究指导,这些患者的血压管理策略仍需进一步明确。(3) 手术处理原则: 根据现有的单中心回顾性研究,当 aSAH 患者合并同流域血管狭窄且需进行介入手术时,应根据狭窄部位和影响采取相应策略。术前 CTP 评估有利于术后功能预测,达峰反应时间 > 4.0 s、体积 > 0 ml 是 3 个月神经学结局的独立因素^[376]。如果狭窄位于颈内动脉或椎动脉颅外段并影响动脉瘤栓塞,可以先进行支架成形术后再栓塞动脉瘤^[377]。如果狭窄位于颈内动脉或椎动脉颅内段,根据狭窄对动脉瘤栓塞的影响,可以选择在致密栓塞动脉瘤后进行球囊扩张和支架成形术,或者在尽可能填塞动脉瘤后进行这些手术^[378]。如果狭窄不影响动脉瘤栓塞,可根据狭窄程度决定是否同期处理病变,若需同期处理,应在动脉瘤栓塞后处理狭窄病变^[379]。

2. 未来研究方向: 对于合并脑血管狭窄的 aSAH 患者,合适的血压控制范围尚不明确,如何在避免再出血的同时维持脑组织正常灌注需要进一步的研究去证实。对于合并脑血管狭窄的 aSAH 患者的手术策略仍缺乏高质量的研究证据,需综合分析狭窄血管、载瘤动脉以及动脉瘤之间的关系。

本指南是在综合当前国内外关于破裂动脉瘤治疗的最新研究和实践的基础上,由众多相关领域的专家共同讨论和审定的成果。尽管本文内容力求准确和全面,但治疗知识和技术的不断进步,意味着今后可能需要进一步修订和更新。本共识代表了参与专家的观点,其内容不具有法律效力,仅作为医疗决策的参考。未来将根据新的研究成果和临床实践经验,定期对本指南进行评估和更新。

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