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冠心病抗血栓诊治的中国临床循证

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摘要 抗血栓诊治作为冠心病管理的关键环节, 在中国经历了从循证借鉴到自主创新的发展历程. 本文系统梳理了我国冠心病抗血栓诊疗领域的临床循证发展与进展, 重点分析了血栓和出血风险的评估、抗血小板和抗凝治疗策略的优化, 以及临床实践规范化在抗血栓领域的突破. 未来, 中国冠心病抗血栓领域将继续朝着精准化、个体化方向迈进, 在抗血栓新靶点探索、出血与缺血风险平衡策略以及真实世界研究等方面具有广阔发展空间.



韩雅玲 中国工程院院士, 北部战区总医院心血管内科主任、寒地心血管病全国重点实验室副主任. 在复杂冠状动脉病变介入治疗、缺血性心肌病及个体化抗血栓治疗等方面完成了大量开创性工作. 目前担任《中华心血管病杂志》《临床军医杂志》及*Cardiology Discovery*总编辑. 曾获国家科技进步二等奖、全国争先创优奖等科技奖励和荣誉.

关键词 冠心病, 抗血栓治疗, 抗血小板治疗, 抗凝治疗, 循证医学

冠心病是严重危害人民健康的重大疾病, 其防治工作一直是我国心血管领域的重中之重[1~3]. 血栓形成在冠状动脉粥样硬化的发展及相关并发症中扮演关键角色, 同时也是引发冠心病患者发生不良心血管事件的主要驱动因素, 往往导致心肌梗死或死亡等严重临床结局[4,5], 因而备受关注. 抗血栓治疗可降低冠心病患者主要不良心血管事件的发生率, 并可明显减少冠状动脉血运重建后的相关并发症, 成为冠心病二级预防的基础[6].

近年来, 中国冠心病抗血栓诊治领域经历了从学习借鉴国际经验到基于我国自主循证研究制定指南的转变, 形成了具有中国特色的抗血栓管理方案. 本文旨在全面梳理中国冠心病抗血栓诊治的临床循证发展历程, 总结当前抗血栓策略的优化与创新, 并展望未来发展方向, 以期为临床实践提供参考, 推动中国冠心病抗血栓诊治水平的进一步提升.

1 中国冠心病血栓与出血风险评分体系的建立与发展

平衡缺血与出血风险是冠心病抗血栓治疗临床决策的核心. 长期以来, 中国临床实践完全依赖如GRACE、CRUSADE、PRECISE-DAPT等基于西方人群建立的国际评分系统[7~9]. 然而, 由于中国人群在遗传背景、生活方式、疾病谱、医疗资源以及出血风险敏感性等方面存在显著差异, 直接套用国外评分可能导致风险评估的偏差. 有研究指出, CRUSADE评分可能高估中国急性冠脉综合征(acute coronary artery, ACS)患者的院内出血风险[10]. 这种“水土不服”催生了建立适合中国人群的、本土化风险评估工具的强烈需求. 经过中国心血管专家的不懈努力, 我国在该领域成

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功实现了从“借鉴应用”到“自主创新”的跨越.

1.1 OPT-CAD评分

冠心病优化抗血小板(Optimal antiPlatelet Therapy for Chinese patients with Coronary Artery Disease, OPT-CAD)研究在全国31个省/直辖市/自治区109家中心共入选14032例接受抗血小板药物治疗的冠心病患者, 从中推导出OPT-CAD缺血风险评分并进行了内部验证[11]. OPT-CAD评分包含10项关键而又常用的临床指标: 年龄、心率、高血压史、心肌梗死史、缺血性卒中史、肾功能不全、贫血、左心室射血分数降低、肌钙蛋白升高、心电图ST段改变. 其低、中、高危风险评分分别为0~90、91~150和≥151分, 对应的缺血事件发生率分别为1.6%、5.5%和15.0%. 与来自西方人群的GRACE风险评分相比, OPT-CAD评分在预测中国冠状动脉疾病患者的缺血性事件及全因死亡方面表现出更高的准确性. 这一评分系统为临床医生提供了更精细的风险分层, 有助于制定更加个性化的治疗方案[12].

1.2 CAMI出血评分

中国急性心肌梗死注册(China Acute Myocardial Infarction registry, CAMI)研究在全国入选16736例接受经皮冠状动脉介入治疗(percutaneous coronary intervention, PCI)的急性心肌梗死(acute myocardial infarction, AMI)患者, 应用机器学习算法从98个临床指标中筛选出最有价值的12个指标构建评分, 包括肌酐清除率、收缩压、直接胆红素、年龄、心率、红细胞压积、肌酸磷酸激酶同工酶、血清K^+、N末端脑钠肽前体、血红蛋白、舒张压和总胆红素[13]. 相较于传统的CRUSADE和ACUITY评分, CAMI出血评分预测中国AMI患者院内发生出血学术研究联合会(Bleeding Academic Research Consortium, BARC)定义的3或5型大出血风险的能力显著提高, 未来或可进一步减少中国AMI人群的出血风险.

此外, 除了原创评分工具, 国内学者还报道了残余SYNTAX评分、血小板聚集率等与接受抗血小板治疗冠心病患者的长期预后有关[14,15], 有可能作为传统临床危险因素的补充研究. 近年来, 多组学技术的快速发展为冠心病风险预测模型的研究提供了新视角[16,17]. 基于大规模、长期随访队列, 通过蛋白组学、代谢组学、基因组学和影像组学等多组学数据, 开发冠心病血栓和出血事件相关的新型标志物并构建精准风险分层模型成为研究热点. 同时, 建立多中心、前瞻性冠心病队列, 通过外部验证新开发的缺血和出血风险模型在真实世界中的有效性及稳定性, 将为冠心病个体化、精准化抗血栓策略的制定提供高质量循证依据.

我国自主研发的血栓与出血风险评分的建立, 具有深远的临床意义. 使中国心血管临床医生能够使用基于我国人群数据开发的“标尺”, 更准确地为患者进行风险评估, 并为不同风险特征的患者选择最适宜的抗血栓策略和药物. 这将直接推动抗血栓治疗的个体化与精准化, 为提升我国冠心病的整体防治水平提供不可或缺的科学工具.

2 中国冠心病抗血栓治疗策略的优化

在冠心病抗栓治疗领域, 我国已从国际指南的“学习者”和“追随者”, 逐步成长为重要的“贡献者”与“规则影响者”. 中国心血管临床医生通过系列高质量临床研究, 为全球冠心病抗血栓策略的优化提供了关键证据, 尤其是在平衡缺血与出血风险这一核心挑战上, 发出了强有力的“中国声音”.

2.1 抗血小板治疗策略的优化

针对冠心病尤其是ACS和接受PCI的患者, 抗血小板治疗是防止支架内血栓形成、降低术后心血管不良事件风险的关键措施[18,19]. 理想的抗血小板策略如同走钢丝, 一端是致命的缺血事件(如心肌梗死、支架内血栓), 另一端是同样可致残甚至致死的出血事件(尤其是消化道或颅内出血). 因此, 现代抗血小板治疗的核心已经从“越强越好、越长越好”的粗放模式, 转变为追求“缺血与出血风险精细平衡”的个体化治疗[20,21]. 在此背景下, 降阶治疗作为一种抗血小板管理策略逐渐受到重视, 其核心在于依据血栓风险变化动态调整治疗方案. 在ACS早期经过一段强化抗血小板治疗后, 随着血栓风险下降, 适时转为强度较低的治疗模式, 旨在平衡抗栓获益与出血风险. 笔者在国内最早系统总结了降阶治疗的多种形式[22], 例如从作用较强的P2Y12抑制剂转换为作用较弱的氯吡格雷、降低P2Y12抑制剂剂量、缩短DAPT疗程, 或在早期即采用P2Y12抑制剂单药治疗等, 为其临床实践提供了参考.

由笔者牵头的EXCEL可降解涂层药物洗脱支架多中心注册研究(Multi-Center Registry of EXCEL Biodegradable Drug Eluting Stent, CREATE)和评估Tivoli生物可降解聚合物雷帕霉素洗脱支架和Firebird2雷帕霉素

钴铬合金冠脉洗脱支架在冠脉血运重建手术中的安全性及有效性的前瞻性、多中心、随机对照研究(Evaluate Safety and Effectiveness of the Tivoli® DES and the Firebird® DES for Treatment of Coronary Revascularization, I LOVE IT 2) 是国内最早开展针对涂层可降解药物洗脱支架(drug-eluting stent, DES)的缩短DAPT疗程降阶方案的研究[23,24]. CREATE研究5年结果表明[23], DAPT疗程长于6个月的患者总出血及主要/轻度出血发生率均明显高于仅接受DAPT 6个月的患者; 而发生出血事件的患者1年随访时心原性死亡、AMI、靶病变血管重建和支架内血栓发生率均增加, 其原因可能与出血发生后停用抗血小板药物时间过久以及受试者同时存在高出血和高缺血风险(双高危)有关. I LOVE IT 2研究结果提示针对稳定性冠心病和低危ACS植入涂层可降解雷帕霉素洗脱冠状动脉支架的患者, 接受6个月DAPT的安全性和有效性不劣于12个月DAPT[24]. 该项研究继2017年被欧洲心脏病学会(European Society of Cardiology, ESC)DAPT指南引用后[25], 于2018年再次被ESC心肌血运重建指南引用[26].

探索冠脉介入后高危患者替格瑞洛单用或与阿司匹林联用的疗效比较研究(Ticagrelor with or without Aspirin in High-Risk Patients after PCI, TWILIGHT)是一项多国、随机双盲安慰剂对照临床研究, 旨在对比高危缺血冠心病患者PCI术后3个月DAPT后强效P2Y12抑制剂替格瑞洛长期单药治疗与常规DAPT的有效性和安全性[27,28]. TWILIGHT研究中国区共有27家中心参加, 最终入选了随机化患者1028例, 占全球病例总数的13%. TWILIGHT China研究结果与主研究结果一致, 发现该治疗策略对于中国缺血高危冠心病患者同样有效, 在不增加全因死亡、非致死性心梗或卒中等缺血风险的同时, 显著降低BARC 2、3或5型出血风险[29]. 据此, PCI后早期P2Y12抑制剂单药治疗的策略首次写入2020年ESC ACS管理指南[30], 这也是国际权威指南中对该治疗方案的首次明确认可.

ACS患者PCI后一个月替格瑞洛单药治疗效果的研究(Ticagrelor Alone versus Ticagrelor plus Aspirin from Month 1 to Month 12 After Percutaneous Coronary Intervention in Patients with Acute Coronary Syndromes, ULTIMATE-DAPT)是我国学者主持的另一项关于PCI后早期P2Y12抑制剂单药治疗策略探讨的随机对照临床试验, 将已完成PCI并接受DAPT 1个月且未发生严重缺血事件的ACS患者, 随机分为两组: 一组继续使用替格瑞洛联合阿司匹林的DAPT方案, 另一组则转为替格瑞洛单药治疗[31]. 结果显示, 在为期12个月的随访中, 与继续联合治疗的患者相比, 采用替格瑞洛单药治疗的患者出血事件发生率显著降低, 但两组的缺血事件(心血管死亡、心梗、缺血性卒中、明确的支架内血栓或临床驱动的靶血管再次血运重建的复合终点)发生率无显著差异, 提示PCI后早期P2Y12抑制剂单药治疗具有更好的临床净获益[32,33]. 该研究被2025年美国ACS管理指南引用[34].

国内开展的另一项抗血小板优化策略重要研究——比较氯吡格雷单药延长治疗与DAPT延长治疗用于出血及缺血高风险的ACS患者的研究(Optimal Antiplatelet Therapy for High Bleeding and Ischemic Risk Patients, OPT-BIRISK), 是首个针对同时合并双高危ACS患者常规DAPT后抗血小板策略的随机对照研究. 研究入选7758例18~85岁接受DES并均满足高出血风险和高缺血风险临床标准的冠心病接受PCI患者[35]. 研究结果表明, PCI后完成DAPT常规疗程9~12个月的ACS患者, 相比于氯吡格雷联合阿司匹林组, 氯吡格雷单药组临床相关出血事件(BARC 2型、3型或5型出血)相对风险显著降低了25%, 同时氯吡格雷单药组主要不良心脑血管事件(包括全因死亡、心梗、卒中或临床驱动的血运重建)相对风险也显著降低了26%[36,37]. 研究首次创新性地提出了PCI术后ACS患者“双高危”的概念与具体标准[38], 为后续科学研究与临床实践提供全新视角并打下了坚实的基础. 同时, 研究首次聚焦于“双高危人群”的抗血小板治疗策略这一临床难点, 巧妙化解了临床医生在平衡缺血与出血风险时面临的两难困境, 填补了相关领域的研究空白, 具有开创性意义.

另一项具有开创性价值的研究是OPT-PEACE研究(安翰磁控胶囊内窥镜评估预防胃肠道损伤的最佳抗血小板疗法, Optimal Antiplatelet Therapy for Prevention of Gastrointestinal Injury Evaluated by Ankon Magnetically Controlled Capsule Endoscopy), 这是一项心内科和消化科专家协作攻关完成的研究, 探索了冠心病患者长期抗血小板治疗对于胃肠道损伤影响的研究[39]. 在DAPT治疗6个月后, 随机分配接受阿司匹林联合氯吡格雷、阿司匹林联合安慰剂和氯吡格雷联合安慰剂治疗三个组. 结果显示[40,41], 与DAPT相比, 单药抗血小板治疗在12个月内对胃肠黏膜的损伤更少, 阿司匹林和氯吡格雷单药治疗效果相似. 在接受至少一次消化

内镜检查的患者中，胃肠道溃疡发生率为37.4%；在所有磁控胶囊胃镜基线检查排除溃疡的患者中，1年内新发溃疡发生率为18.3%，提示长期抗栓治疗管理过程中应加强对胃肠道损伤的检测和处理．本研究首次全面揭示了不同抗血小板治疗方案导致胃肠黏膜损伤的真实发生率，从保护胃肠黏膜的视角出发，为临床优化治疗方案、平衡疗效与安全性提供了精准的循证依据．该研究被2024年ESC慢性冠脉综合征管理指南引用[42]．

我国一项开放标签随机对照临床研究OPTION(接受PCI的高出血风险患者最佳抗血小板治疗策略探讨，Optimal Antiplatelet Therapy for Patients with High Bleeding Risk Undergoing PCI)显示[43]，在心脏肌钙蛋白阴性且接受PCI治疗的冠心病患者中，与传统的阿司匹林联合氯吡格雷方案相比，采用吲哚布芬联合氯吡格雷治疗可显著降低1年净临床不良结局的风险，这一获益主要源于出血事件发生率的下降，提示对于高出血风险或存在消化道损伤潜在风险的患者，可考虑以吲哚布芬作为阿司匹林的替代选择．

2.2 PCI围术期抗凝策略的优化

PCI围术期抗凝治疗的核心目标是抑制血管损伤后血小板聚集与凝血瀑布激活，预防导管内血栓、支架内血栓等缺血事件的关键环节，同时最大限度减少出血并发症[44]．临床需结合患者缺血/出血风险、手术类型、应用器械、合并症(如肾功能、年龄)，选择合适的抗凝药物与剂量方案．

近年来新型凝血酶抑制剂比伐芦定在急诊PCI中应用的有效性和安全性是该领域国内外的研究热点[45,46]．早期三项国际知名大规模临床研究[HORIZONS-AMI研究(Harmonizing Outcomes with Revascularization and Stents in Acute Myocardial Infarction,急性心肌梗死患者冠脉血运重建和支架的结局标准化)、EuroMax研究(European Ambulance Acute Coronary Syndrome Angiography，欧洲救护车急性冠脉综合征血管造影研究)、HEAT–PPCI研究(Unfractionated Heparin versus Bivalirudin in Primary Percutaneous Coronary Intervention,普通肝素对比比伐芦定在直接PCI中的应用)]结果均显示[47~49]，术中应用比伐芦定患者术后血栓发生率高于普通肝素组．由中国82家中心完成的BRIGHT研究(The Bivalirudin in Acute Myocardial Infarction vs Heparin and GPI Plus Heparin Trial，比伐芦定对比普通肝素以及普通肝素联合血小板糖蛋白IIb/IIIa受体拮抗剂在急性心肌梗死中的应用)，针对AMI急诊PCI术中应用比伐芦定抗凝后急性支架内血栓发生率较普通肝素治疗后增高的难点问题，根据抗凝药物和抗血小板药物之间的药代动力学以及药物疗效之间衔接的关系，提出了急诊PCI术后短期高剂量持续使用比伐芦定的新策略，覆盖了抗血小板药物尚未完全起效的抗栓药物空窗期，有效降低了急性支架内血栓风险[50]，这是国际上第一次发现根据药代动力学合理使用比伐芦定支架内血栓风险不增高的随机对照研究．

BRIGHT研究发表后，虽然没能挽救ESC临床指南对比伐芦定推荐等级的下调(Ⅰ→Ⅱa→Ⅱb)，但其在美国临床指南中的推荐级别因研究发表没有同步下调[51]．为了进一步回答经桡动脉PCI比例显著提高、血小板糖蛋白Ⅱb/Ⅲa受体拮抗剂临床使用比例显著减少的情况下，比伐芦定降低出血的获益是否减少，以及PCI术后延长注射高剂量比伐芦定，是否仍可减少急性/亚急性支架血栓风险等问题，由笔者牵头开展的BRIGHT-4研究(Bivalirudin With Prolonged Full-Dose Infusion During Primary PCI Versus Heparin，延长全剂量滴注比伐芦定对比普通肝素在直接PCI中的应用)在设计之初就抱着能解决以往相关研究的异质性问题，以达到“一锤定音”的期待[52]．结果显示[52~55]，首次急诊经桡动脉行PCI的急性ST段抬高型心肌梗死(ST elevation myocardial infarction, STEMI)患者，术中使用比伐芦定抗凝，辅以术后2~4 h高剂量持续静脉使用，与单用普通肝素相比，可使30天全因死亡或BARC 3或5型大出血事件的相对风险降低31%，其中全因死亡率降低25%，大出血率降低79%；支架血栓风险降低67%，再次证实了比伐芦定延长滴注这一创新方案的有效性和安全性．

2023年ESC ACS管理指南引用了BRIGHT研究和BRIGHT-4研究成果，并将比伐芦定PCI后持续高剂量注射策略推荐级别从Ⅱb升为Ⅱa[56]．尤为可喜的是，2025年美国ACS管理指南对比伐芦定相关推荐更为积极，推荐在接受PCI的STEMI患者中，比伐芦定可替代普通肝素，以降低死亡和出血发生率(I, B-R)[34]．支持本条推荐的文献共有6篇[47,49,50,55,57,58]，包括4项随机对照临床研究(中国的BRIGHT研究、BRIGHT-4研究、美国的HORIZINS-AMI研究和欧洲的EUROMAX研究)和2篇荟萃分析(均引用了BRIGHT研究)，显示出中国证据在改变国际临床指南中的作用．

我国学者牵头开展的RIGHT试验(Comparison of

Anticoagulation Prolongation vs no Anticoagulation in STEMI Patients After Primary PCI, STEMI患者直接PCI术后延长抗凝治疗与不抗凝治疗的比较)是国际上首个评估STEMI患者直接PCI术后抗凝治疗能否带来获益的随机临床试验，术后分别接受小剂量常规抗凝或安慰剂治疗至少48 h[59]. 结果表明[60]，直接PCI术后常规抗凝治疗既未降低全因死亡、非致命性心梗、非致命性卒中、明确的支架内血栓或任何紧急血运重建的复合终点事件风险，也未增加BARC 3或5型大出血风险. 该研究终结了临床对STEMI直接PCI术后常规抗凝的争议，除特殊情况(如左心室血栓或房颤)外，术后无需常规使用肠外抗凝剂. 既往我国临床实践中75.4%的经验性抗凝使用率缺乏循证支持，该结论为指南修订提供了重要依据.

国内36家中心完成的HELP-PCI研究(Heparin Administration at First Medical Contact vs Immediately Before Primary Percutaneous Coronary Intervention, 首次医疗接触时与直接PCI术前即刻应用普通肝素的比较)旨在评估接受急诊PCI的STEMI患者在首次医疗接触时早期应用普通肝素的有效性和安全性. 研究结果显示[61]，在首次医疗接触时使用负荷剂量的普通肝素预处理与梗死相关动脉自发再灌注的改善相关，且并未增加主要出血的风险. 同时, 提早使用普通肝素可改善30天内出现主要不良心脑血管事件风险，减少了因心力衰竭而再次入院的风险. 该研究开创了STEMI救治的新范式，有望为国际临床指南更新提供中国数据支撑.

3 中国冠心病抗血栓诊疗的临床实践规范化

临床指南是冠心病抗血栓治疗规范化的“风向标”和“度量衡”, 基于高质量研究证据, 将复杂的循证医学结论转化为可落地的临床路径，在统一治疗标准、规避实践偏差、保障患者安全等方面发挥不可替代的作用. 首先, 临床指南为抗血栓治疗提供了循证依据支撑, 比如系统整合BRIGHT、BRIGHT-4、ULTIMATE-DAPT等关键研究成果[62], 明确推荐“直接PCI术中选用比伐芦定替代普通肝素抗凝”“高出血风险患者DAPT早期降阶”等策略，可使临床决策摆脱经验依赖，确保治疗方案有充分证据支持，避免过度抗栓或治疗不足. 其次, 临床指南统一治疗标准与操作路径, 针对不同临床场景，指南明确了药物选择、剂量规范、疗程时长, 甚至细化了特殊人群的调整方案，形成一步一指引的操作框架，让不同层级医院、不同经验医生的治疗行为趋于一致, 减少因认知差异导致的预后差距[63,64]. 再者, 临床指南指导个体化风险分层, 有助于平衡疗效与安全. 指南推荐OPT-CAD等评分工具，可以明确“高缺血+低出血”“高缺血+高出血”等不同风险组合的治疗方案，如前者可延长DAPT，后者推荐标准DAPT后P2Y12抑制剂单药治疗，既避免一刀切式治疗，又为个体化方案提供标准化参考，帮助医生在防血栓与防出血间精准权衡[12]. 最后, 临床指南有助于推动治疗质量持续提升. 指南通过定期更新, 引导临床实践紧跟循证进展, 最终实现冠心病抗血栓治疗从经验到规范, 再到优质的进阶[65].

近年来，在中华医学会心血管病学分会等学术组织的大力倡导下, 由各相关专业学组牵头, 针对临床亟须解决的问题，制定了多部冠心病抗血栓治疗专业指南或共识，并对其他专业指南中的抗栓治疗相关内容进行了更新. 指南/共识的制定、更新与推广对指导我国临床规范化抗栓治疗起到了重要的推动作用.

4 总结与展望

中国冠心病抗血栓诊治领域经历了从借鉴国际经验到自主创新的发展历程，在指南体系完善、循证研究积累和临床实践优化等方面取得了显著成绩. 但在顶层循证医学证据的构建上仍面临结构性挑战. 首先, 抗栓治疗存在显著的种族和地域差异，直接将西方人群的研究结论应用于中国患者可能存在风险，这凸显了建立我国人群特异性流行病学与疗效数据库的极端重要性. 然而，能够系统评估中国各类人群(如不同地区、特殊合并症患者)长期抗栓治疗风险获益比的前瞻性队列数据仍显薄弱，这限制了对国人抗栓疗效与安全性的精准把握. 其次, 由中国学者主导发起、以中国临床实践问题为核心、其结论足以直接改写全球性权威指南的里程碑式研究仍极少. 这种现状导致在国际抗栓治疗指南的制定中，来自中国人群的高级别证据权重有限，也使得部分国际指南用于国内临床实践时可能面临水土不服的问题. 再次, 在新型药物靶点等前沿领域, 国内基础研究产出丰富, 但将其高效转化为可用于临床试验的候选产品或治疗方案的路径尚不通畅. 同时, 作为转化关键环节的、设计精良的I/II期首次人体研究、概念验证性研究数量和质量均存在提升的空间. 最后，循证实践与临床落实之间存在差距，如何在我国不同等级医院、城乡差异等情况下，有效推广、

监测和优化抗栓方案, 对抗栓策略的成本效益, 以及对中国患者生活质量、治疗偏好和用药依从性的深入研究比较少.

展望未来, 将围绕“更精准、更安全、更普惠”的目标, 在技术突破、方案优化与管理模式革新中持续进阶, 进一步改善患者预后. 笔者管见, 一是大力发展大数据和人工智能技术支持下的风险评估和治疗决策辅助. 随着互联网+、大数据及人工智能的迅速崛起, 技术上的壁垒正在消退, 希望通过多中心数据共享, 积累中国冠心病抗血栓治疗的大数据, 为进一步开发综合性的风险评估及治疗决策辅助系统打下坚实的基础[66]. 二是真实世界研究和随机对照研究齐头并进. 除随机对照临床研究外, 真实世界临床研究也将逐渐迎来快速发展. 医疗大数据带来更多高质量的数据信息, 夯实了真实世界研究的基础, 研究方法学不断完善使真实世界研究结果更加可靠. 真实世界研究良好的可推广性和患者广谱性将使其成为特殊人群个体化优化抗血栓策略研究的主力军. 三是更安全的新型抗血栓药物和抗血栓治疗策略研发. 国产新型抗血栓药物研发将突破国外专利壁垒, 降低药物成本, 提升治疗可及性. 由国内独立研发的1.1类新药维卡格雷通过肠道酯酶代谢为活性产物, 无需经肝脏细胞色素P450酶系代谢, 可望通过更加安全的小剂量达到与氯吡格雷相同的抗栓效果[67,68]. 同时, 特殊人群(如老年、合并糖尿病或肾功能不全患者)的抗血栓策略研究也是今后抗血栓治疗发展的重点方向. 四是患者全程管理体系的完善. 依托 “互联网+医疗”, 将构建从院内治疗到院外随访的闭环管理, 通过智能服药提醒、远程出血监测, 提升患者依从性; 同时加强公众教育, 普及抗血栓治疗常识, 避免自行停药或盲目调整剂量, 将会推动抗血栓治疗从院内规范延伸至院外安全.

随着中国人口老龄化进程加速和冠心病发病率持续攀升, 优化抗血栓策略、平衡缺血与出血风险将成为永恒的主题. 我国冠心病抗血栓治疗未来将以精准化为核心、本土化为支撑、多学科为保障, 在技术与管理双重驱动下, 通过大数据整合和国际合作, 不断提升冠心病抗血栓诊治水平, 为全球冠心病防治贡献中国智慧和中国方案.

参考文献

1 Han Y L, Li Y. History and development of percutaneous coronary intervention for coronary heart disease in China (in Chinese). Chin J Cardiol, 2021, 49: 645–649 [韩雅玲, 李洋. 中国冠心病介入治疗开创及发展史. 中华心血管病杂志, 2021, 49: 645–649]

2 Han Y L, Li Y. Emergency coronary intervention treatment for acute myocardial infarction: reach back on the past 40 years (in Chinese). Chin J Cardiol, 2023, 51: 1207–1211 [韩雅玲, 李洋. 急性心肌梗死急诊冠状动脉介入治疗40年回顾. 中华心血管病杂志, 2023, 51: 1207–1211]

3 Liu Q, Liu F, Li J, et al. Sedentary behavior and risk of incident cardiovascular disease among Chinese adults. Sci Bull, 2020, 65: 1760–1766

4 Li Y, Han Y L. Path of exploration for the optimal antithrombotic treatment strategy for patients with coronary heart disease (in Chinese). Chin J Cardiol, 2022, 50: 429–431 [李洋, 韩雅玲. 冠心病精准抗栓治疗策略的探索之路. 中华心血管病杂志, 2022, 50: 429–431]

5 Longo D L, Rodriguez F, Harrington R A. Management of antithrombotic therapy after acute coronary syndromes. N Engl J Med, 2021, 384: 452–460

6 Galli M, Gragnano F, Berteotti M, et al. Antithrombotic therapy in high bleeding risk, part I. JACC-Cardiovasc Interventions, 2024, 17: 2197–2215

7 Costa F, van Klaveren D, James S, et al. Derivation and validation of the predicting bleeding complications in patients undergoing stent implantation and subsequent dual antiplatelet therapy (PRECISE-DAPT) score: a pooled analysis of individual-patient datasets from clinical trials. Lancet, 2017, 389: 1025–1034

8 Eagle K A, Lim M J, Dabbous O H. A validated prediction model for all forms of acute coronary syndrome: estimating the risk of 6-Aug postdischarge death in an international registry. ACC Curr J Rev, 2004, 13: 9

9 Subherwal S, Bach R G, Chen A Y, et al. Baseline risk of major bleeding in non–ST-segment–elevation myocardial infarction. Circulation, 2009, 119: 1873–1882

10 Liu R. Comparison of the performance of the crusade, acuity-horizons, and action bleeding scores in ACS patients undergoing PCI: insights from a cohort of 4939 patients in China. Eur Heart J, 2017, 38: 93–99

11 Han Y, Chen J, Qiu M, et al. Predicting long-term ischemic events using routine clinical parameters in patients with coronary artery disease: the Opt-CAD risk score. Cardiovasc Ther, 2018, 36: e12441

12 Chinese Society of Cardiology, Chinese Medical Association; Editorial Board of Chinese Journal of Cardiology. Guidelines for the management of non-ST elevation acute coronary syndromes (2024) (in Chinese). Chin J Cardiol, 2024, 52: 615–646 [中华医学会心血管病学分会, 中华心血管病

杂志编辑委员会. 非ST段抬高型急性冠脉综合征诊断和治疗指南(2024). 中华心血管病杂志, 2024, 52: 615–646]
13 Zhao X, Wang J, Yang J, et al. Machine learning for prediction of bleeding in acute myocardial infarction patients after percutaneous coronary intervention. Ther Adv Chronic Dis, 2023, 14: 20406223231158561
14 Qiu M, Li Y, Li J, et al. Impact of six versus 12 months of dual antiplatelet therapy in patients with drug-eluting stent implantation after risk stratification with the residual SYNTAX score: results from a secondary analysis of the I-LOVE-IT 2 trial. Cathet Cardio Intervent, 2017, 89: 565–573
15 Gao X F, Lu S, Ge Z, et al. Relationship between high platelet reactivity on clopidogrel and long-term clinical outcomes after drug-eluting stents implantation (PAINT-DES): a prospective, propensity score-matched cohort study. BMC Cardiovasc Disord, 2018, 18: 103
16 Lu X, Liu Z, Cui Q, et al. A polygenic risk score improves risk stratification of coronary artery disease: a large-scale prospective Chinese cohort study. Eur Heart J, 2022, 43: 1702–1711
17 Patel A P, Wang M, Ruan Y, et al. A multi-ancestry polygenic risk score improves risk prediction for coronary artery disease. Nat Med, 2023, 29: 1793–1803
18 Ullah W, Sandhyavenu H, Taha A, et al. Antiplatelet strategy for patients with acute coronary syndrome undergoing percutaneous coronary intervention: a systematic review and network meta-analysis. J Am Heart Assoc, 2024, 13: e032490
19 Nascimento B R, Gewehr D M, De Carvalho L M S P, et al. Short-term dual antiplatelet therapy after drug-eluting stenting in patients with acute coronary syndromes: a Bayesian network meta-analysis of randomized controlled trials. J Am Coll Cardiol, 2024, 83: 846
20 Tarantini G, Honton B, Paradies V, et al. Early discontinuation of aspirin after PCI in low-risk acute myocardial infarction. N Engl J Med, 2025, 393: 2083–2094
21 Guimarães P O, Franken M, Tavares C A M, et al. Early withdrawal of aspirin after PCI in acute coronary syndromes. N Engl J Med, 2025, 393: 2095–2106
22 Han Y L. De-escalation of anti-platelet therapy in patients with acute coronary syndromes undergoing percutaneous coronary intervention. Chin Med J, 2019, 132: 197–210
23 Han Y L, Zhang L, Yang L X, et al. A new generation of biodegradable polymer-coated sirolimus-eluting stents for the treatment of coronary artery disease: final 5-year clinical outcomes from the CREATE study. EuroIntervention, 2012, 8: 815–822
24 Han Y, Xu K, Jing Q, et al. TCT-81 six versus twelve months of dual antiplatelet therapy after implantation of biodegradable polymer sirolimus-eluting stent: a randomized substudy of the I-LOVE-IT 2 trial. J Am Coll Cardiol, 2015, 66: B38
25 Valgimigli M, Bueno H, Byrne R A, et al. 2017 ESC focused update on dual antiplatelet therapy in coronary artery disease developed in collaboration with EACTS. Eur Heart J, 2018, 39: 213–260
26 Neumann F J, Sousa-Uva M, Ahlsson A, et al. 2018 ESC/EACTS guidelines on myocardial revascularization. Eur Heart J, 2019, 40: 87–165
27 Mehran R, Baber U, Sharma S K, et al. Ticagrelor with or without aspirin in high-risk patients after PCI. N Engl J Med, 2019, 381: 2032–2042
28 Baber U, Dangas G, Angiolillo D J, et al. Ticagrelor alone *vs*. ticagrelor plus aspirin following percutaneous coronary intervention in patients with non-ST-segment elevation acute coronary syndromes: TWILIGHT-ACS. Eur Heart J, 2020, 41: 3533–3545
29 Han Y, Claessen B E, Chen S L, et al. Ticagrelor with or without aspirin in Chinese patients undergoing percutaneous coronary intervention: a TWILIGHT China substudy. Circ-Cardiovasc Interventions, 2022, 15: e009495
30 Collet J P, Thiele H, Barbato E, et al. 2020 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Eur Heart J, 2021, 42: 1289–1367
31 Ge Z, Gao X F, Kan J, et al. Comparison of one-month versus twelve-month dual antiplatelet therapy after implantation of drug-eluting stents guided by either intravascular ultrasound or angiography in patients with acute coronary syndrome: rationale and design of prospective, multicenter, randomized, controlled IVUS-ACS and ULTIMATE-DAPT trial. Am Heart J, 2021, 236: 49–58
32 Ge Z, Kan J, Gao X, et al. Ticagrelor alone versus ticagrelor plus aspirin from month 1 to month 12 after percutaneous coronary intervention in patients with acute coronary syndromes (ULTIMATE-DAPT): a randomised, placebo-controlled, double-blind clinical trial. Lancet, 2024, 403: 1866–1878
33 Gao X, Kan J, Wu Z, et al. IVUS-guided vs angiography-guided PCI in patients with diabetes with acute coronary syndromes. JACC-Cardiovasc Interv, 2025, 18: 283–293
34 Rao S V, O'donoghue M L, Ruel M, et al. 2025 ACC/AHA/ACEP/NAEMSP/SCAI guideline for the management of patients with acute coronary syndromes: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Circulation, 2025, 151: e771–e862
35 Li Y, Jing Q, Wang B, et al. Extended antiplatelet therapy with clopidogrel alone versus clopidogrel plus aspirin after completion of 9-to 12-month dual antiplatelet therapy for acute coronary syndrome patients with both high bleeding and ischemic risk. Rationale and design of the OPT-BIRISK double-blinded, placebo-controlled randomized trial. Am Heart J, 2020, 228: 1–7
36 Li Y, Li J, Wang B, et al. Extended clopidogrel monotherapy vs DAPT in patients with acute coronary syndromes at high ischemic and bleeding

risk. JAMA Cardiol, 2024, 9: 523
37 Zhang S, Li J, Qiu M, et al. Comparison of clopidogrel monotherapy versus prolonged DAPT based on the GRACE risk score in patients with acute coronary syndromes at high ischemic and bleeding risk: a subgroup analysis of the OPT-BIRISK randomized clinical trial. Eur J Pharmacol, 2025, 1006: 178151
38 Na K, Qiu M, Wei N, et al. Effect of dual antiplatelet therapy prolongation in acute coronary syndrome patients with both high ischemic and bleeding risk: insight from the OPT-CAD study. Front Cardiovasc Med, 2023, 10: 1201091
39 Li Y, Wang X, Bao D, et al. Optimal antiplatelet therapy for prevention of gastrointestinal injury evaluated by ANKON magnetically controlled capsule endoscopy: rationale and design of the OPT-PEACE trial. Am Heart J, 2020, 228: 8–16
40 Han Y, Liao Z, Li Y, et al. Magnetically controlled capsule endoscopy for assessment of antiplatelet therapy–induced gastrointestinal injury. J Am Coll Cardiol, 2022, 79: 116–128
41 He C, Li Y, Jiang X, et al. Progression of gastrointestinal injury during antiplatelet therapy after percutaneous coronary intervention. JAMA Netw Open, 2023, 6: e2343219
42 Vrints C, Andreotti F, Koskinas K C, et al. 2024 ESC Guidelines for the management of chronic coronary syndromes. Eur Heart J, 2024, 45: 3415–3537
43 Wu H, Xu L, Zhao X, et al. Indobufen or aspirin on top of clopidogrel after coronary drug-eluting stent implantation (OPTION): a randomized, open-label, end point–blinded, noninferiority trial. Circulation, 2023, 147: 212–222
44 Franchi F, Rollini F, Angiolillo D J. Antithrombotic therapy for patients with STEMI undergoing primary PCI. Nat Rev Cardiol, 2017, 14: 361–379
45 Stone G W, Valgimigli M, Erlinge D, et al. Bivalirudin vs heparin anticoagulation in STEMI. J Am Coll Cardiol, 2024, 84: 1512–1524
46 Bikdeli B, Erlinge D, Valgimigli M, et al. Bivalirudin versus heparin during PCI in NSTEMI: individual patient data meta-analysis of large randomized trials. Circulation, 2023, 148: 1207–1219
47 Stone G W, Witzenbichler B, Guagliumi G, et al. Bivalirudin during primary PCI in acute myocardial infarction. N Engl J Med, 2008, 358: 2218–2230
48 Shahzad A, Kemp I, Mars C, et al. Unfractionated heparin versus bivalirudin in primary percutaneous coronary intervention (HEAT-PPCI): an open-label, single centre, randomised controlled trial. Lancet, 2014, 384: 1849–1858
49 Steg P G, van 't Hof A, Hamm C W, et al. Bivalirudin started during emergency transport for primary PCI. N Engl J Med, 2013, 369: 2207–2217
50 Han Y, Guo J, Zheng Y, et al. Bivalirudin vs heparin with or without tirofiban during primary percutaneous coronary intervention in acute myocardial infarction. JAMA, 2015, 313: 1336
51 Li Y, Li Y, Stone G W, et al. Bivalirudin in primary PCI: can its glory being restored? Cardiol Discov, 2021, 1: 179–194
52 Liang Z, Li Y, Stone G W, et al. Rationale and design of a randomized controlled trial of bivalirudin with a prolonged high-dose infusion versus heparin monotherapy during primary percutaneous coronary intervention in patients with acute ST-segment elevation myocardial infarction: the BRIGHT-4 trial. Cardiol Discov, 2022, 2: 226–230
53 Li Y, Liang Z, Li Y, et al. Ticagrelor *vs*. clopidogrel in bivalirudin-treated patients with STEMI undergoing primary PCI: the BRIGHT-4 trial. Cardiovasc Revascularization Med, 2025, doi: 10.1016/j.carrev.2025.05.007
54 Zhang D, Li Y, Qiu M, et al. BMI differences on anticoagulation with bivalirudin *vs*. heparin during primary PCI: a BRIGHT-4 subanalysis. BMC Med, 2025, 23: 525
55 Li Y, Liang Z, Qin L, et al. Bivalirudin plus a high-dose infusion versus heparin monotherapy in patients with ST-segment elevation myocardial infarction undergoing primary percutaneous coronary intervention: a randomised trial. Lancet, 2022, 400: 1847–1857
56 Byrne R A, Rossello X, Coughlan J J, et al. 2023 ESC Guidelines for the management of acute coronary syndromes. Eur Heart J, 2023, 44: 3720–3826
57 Cavender M A, Sabatine M S. Bivalirudin versus heparin in patients planned for percutaneous coronary intervention: a meta-analysis of randomised controlled trials. Lancet, 2014, 384: 599–606
58 Bangalore S, Toklu B, Kotwal A, et al. Anticoagulant therapy during primary percutaneous coronary intervention for acute myocardial infarction: a meta-analysis of randomized trials in the era of stents and P2Y12 inhibitors. Br Med J, 2014, 349: g6419
59 Yan Y, Wang X, Guo J, et al. Rationale and design of the RIGHT trial: a multicenter, randomized, double-blind, placebo-controlled trial of anticoagulation prolongation versus no anticoagulation after primary percutaneous coronary intervention for ST-segment elevation myocardial infarction. Am Heart J, 2020, 227: 19–30
60 Yan Y, Guo J, Wang X, et al. Postprocedural anticoagulation after primary percutaneous coronary intervention for ST-segment–elevation myocardial infarction: a multicenter, randomized, double-blind trial. Circulation, 2024, 149: 1258–1267
61 Chen J, Xu C, Qiu L, et al. Heparin administration at first medical contact vs immediately before primary percutaneous coronary intervention: the HELP-PCI trial. Eur Heart J, 2025, 46: 3888–3901
62 Chinese Society of Cardiology, Chinese Medical Association; Editorial Board of Chinese Journal of Cardiology. Guidelines for percutaneous

coronary intervention (2025) (in Chinese). Chin J Cardiol, 2025, 53: 717–745 [中华医学会心血管病学分会, 中华心血管病杂志编辑委员会. 经皮冠状动脉介入治疗指南(2025). 中华心血管病杂志, 2025, 53: 717–745]

63 Section of Interventional Cardiology of Chinese Society of Cardiology of Chinese Medical Association; Specialty Committee on Prevention and Treatment of Thrombosis of Chinese College of Cardiovascular Physicians. Chinese expert consensus on use of parenteral anticoagulants during the peri-percutaneous coronary intervention period (in Chinese). Chin J Cardiol, 2018, 46: 428–437 [中华医学会心血管病学分会介入心脏病学组, 中国医师协会心血管内科医师分会血栓防治专业委员会. 经皮冠状动脉介入治疗围术期非口服抗凝药物临床应用中国专家共识. 中华心血管病杂志, 2018, 46: 428–437]

64 Speciality Committee on Prevention and Treatment of Thrombosis of Chinese College of Cardiovascular Physicians; Interventional Cardiology Branch of Chinese Society of Cardiology of Chinese Medical Association; Editorial Board of Chinese Journal of Cardiology. Chinese expert consensus on antiplatelet therapy for special patients with acute coronary syndromes (in Chinese). Chin J Cardiol, 2018, 46: 255–266 [中国医师协会心血管内科医师分会血栓防治专业委员会, 中华医学会心血管病学分会介入心脏病学组, 中华心血管病杂志编辑委员会. 急性冠状动脉综合征特殊人群抗血小板治疗中国专家建议. 中华心血管病杂志, 2018, 46: 255–266]

65 Atherosclerosis and Coronary Heart Disease Working Group of Chinese Society of Cardiology; Interventional Cardiology Working Group of Chinese Society of Cardiology; Specialty Committee on Prevention and Treatment of Thrombosis of Chinese College of Cardiovascular Physicians, et al. Chinese Society of Cardiology and Chinese College of Cardiovascular Physicians Expert Consensus statement on dual antiplatelet therapy in patients with coronary artery disease (in Chinese). Chin J Cardiol, 2021, 49: 432–454 [中华医学会心血管病学分会动脉粥样硬化与冠心病学组, 中华医学会心血管病学分会介入心脏病学组, 中国医师协会心血管内科医师分会血栓防治专业委员会, 等. 冠心病双联抗血小板治疗中国专家共识. 中华心血管病杂志, 2021, 49: 432–454]

66 Qiu M H, Li Y, Xu K, et al. Key data elements for clinical management and outcomes of patients with coronary artery disease: definitions from Coronary Artery Disease and Creative Antithrombotic Clinical Research Collaboration (CardiaCare) (in Chinese). Chin J Cardiol, 2021, 49: 1082–1088 [裘森涵, 李毅, 徐凯, 等. 冠心病患者诊疗过程及临床结局中关键数据标准字段集: 基于cardiacare多中心临床科研创新平台. 中华心血管病杂志, 2021, 49: 1082–1088]

67 Liu C, Zhang Y, Chen W, et al. Pharmacokinetics and pharmacokinetic/pharmacodynamic relationship of vicagrel, a novel thienopyridine P2Y12 inhibitor, compared with clopidogrel in healthy Chinese subjects following single oral dosing. Eur J Pharm Sci, 2019, 127: 151–160

68 Zhang Y, Zhu X, Zhan Y, et al. Impacts of CYP2C19 genetic polymorphisms on bioavailability and effect on platelet adhesion of vicagrel, a novel thienopyridine $P2Y_{12}$ inhibitor. Brit J Clin Pharma, 2020, 86: 1860–1874

Summary for “冠心病抗血栓诊治的中国临床循证”

Chinese evidence-based antithrombotic therapy for coronary heart disease

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The management of antithrombotic therapy represents a pivotal aspect in the treatment of coronary artery disease (CAD). In China, this field has evolved from a phase of learning from international evidence to a new era characterized by significant domestic innovation and contribution. This review systematically synthesizes the clinical evidence and advancements in antithrombotic strategies for CAD within the Chinese context, focusing on risk assessment, therapeutic optimization, and the standardization of clinical practice.

The cornerstone of contemporary antithrombotic decision-making lies in the precise balance between ischemic and bleeding risks. Recognizing the limitations of applying Western-derived risk scores to the Chinese population due to genetic, lifestyle, and clinical practice differences, China has developed its own risk stratification tools. The OPT-CAD score, derived from a large, nationwide cohort, provides a more accurate prediction of long-term ischemic events and all-cause mortality for Chinese patients compared to the GRACE score. Similarly, the CAMI bleeding score outperforms traditional scores like CRUSADE in predicting in-hospital major bleeding after percutaneous coronary intervention (PCI) for acute myocardial infarction (AMI). These tools mark a critical transition from reliance on foreign models to the provision of locally validated rulers for risk assessment, enabling more tailored treatment strategies.

In optimizing antithrombotic strategies, Chinese research has made substantial contributions to global guidelines, particularly in navigating the ischemia-bleeding trade-off. For antiplatelet therapy, the paradigm has shifted from a uniform, intense regimen to personalized, de-escalation approaches. Landmark Chinese studies, such as CREATE and I LOVE IT 2, have provided robust evidence for shortening dual antiplatelet therapy (DAPT) duration after implantation of specific drug-eluting stents. Furthermore, studies like TWILIGHT-China and ULTIMATE-DAPT have demonstrated the safety and efficacy of early transition to P2Y12 inhibitor monotherapy after a brief period (1–3 months) of DAPT in high-risk patients, reducing bleeding without increasing ischemic events. The OPT-BIRISK trial offered a novel strategy for patients with both high ischemic and high bleeding risk, showing the benefit of extended clopidogrel monotherapy after completing standard DAPT. Research has also extended to minimizing extracardiac harm, with the OPT-PEACE trial using novel endoscopic technology to quantify gastrointestinal injury from different antiplatelet regimens, informing safer drug selection. In addition, the OPTION trial suggested indobufen as a potential alternative to aspirin in combination with clopidogrel.

Regarding periprocedural anticoagulation during PCI, Chinese-led trials have reshaped international perspectives. The BRIGHT study introduced an innovative strategy of post-PCI high-dose infusion of bivalirudin, which mitigated the increased acute stent thrombosis risk previously associated with this agent and significantly reduced bleeding. The subsequent BRIGHT-4 trial confirmed these benefits in a contemporary STEMI population, leading to upgraded recommendations in international guidelines.

The standardization of clinical practice in China has been greatly advanced by the development and continuous updating of national guidelines and expert consensuses, which promote uniformity in treatment standards across different healthcare settings, guide individualized risk stratification, and ultimately drive continuous quality improvement in antithrombotic care for CAD patients nationwide.

In the future, the antithrombotic therapy in China is oriented towards greater precision, safety, and accessibility. Key directions include leveraging big data and artificial intelligence to refine risk prediction and decision support, expanding high-quality real-world evidence, developing safer novel agents (e.g., vicagrel), and improving patient-centric management through digital health technologies. As the burden of CAD continues to grow with an aging population, China is poised to further integrate innovation, localization, and multidisciplinary collaboration to optimize antithrombotic strategies, aiming to improve patient outcomes and contribute Chinese wisdom to the global fight against cardiovascular disease.

coronary heart disease, antithrombotic therapy, antiplatelet therapy, anticoagulation therapy, evidence-based medicine

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