

## 心肌梗死后室性心动过速导管消融适应证在指南共识中的演变

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**【摘要】** 室性心动过速(VT)是心肌梗死患者死亡的主要原因之一。植入型心律转复除颤器在预防心源性猝死方面非常有效,但 VT 发作时频繁放电给患者造成痛苦且除颤后不能改变 VT 发生的基质,而且无法进行 VT 的病因治疗导致 VT 复发。长期应用抗心律失常药物治疗心肌梗死后 VT 效果不佳但副作用明显。导管消融可标测心肌梗死后心肌基质,并可揭示心动过速发生的机制,是心肌梗死后 VT 的有效治疗方法。现就心肌梗死后 VT 导管消融的适应证在指南和共识中的演变做一汇总,旨在为致力于相关领域的工作者提供帮助。

**【关键词】** 心肌梗死;室性心动过速;导管消融;适应证;演变

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## Evolution of Indications for Ablation of Ventricular Tachycardia after Myocardial Infarction in Guidelines and Consensus

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**【Abstract】** Ventricular tachycardia is one of the leading causes of death in patients with myocardial infarction. Implantable cardioverter defibrillator is very effective in preventing sudden cardiac death, but frequent discharge during ventricular tachycardia causes pain to the patient, and cannot alter the substrate of ventricular tachycardia. The treatment of etiology of ventricular tachycardia cannot be carried out, which leads to recurrence of ventricular tachycardia. Long-term use of antiarrhythmic drugs to treat ventricular tachycardia after myocardial infarction has limited effect but obvious side effects. Catheter ablation can map the myocardial substrate after myocardial infarction and reveal the mechanism of tachycardia. So, it is an effective treatment for ventricular tachycardia after myocardial infarction. This article summarizes the evolution of indications for catheter ablation of ventricular tachycardia after myocardial infarction in the guidelines and consensus to provide assistance for the workers in related fields.

**【Key words】** Myocardial infarction; Ventricular tachycardia; Catheter ablation; Indications; Evolution

室性心动过速(ventricular tachycardia, VT)是心肌梗死(myocardial infarction, MI)后严重甚至危及生命的并发症,VT也是死亡率增加的危险因素<sup>[1]</sup>。尽管植入型心律转复除颤器(implantable cardioverter defibrillator, ICD)用作一级或二级预防性治疗可有效预防猝死<sup>[2-3]</sup>,但心律失常的基质仍存在,故易复发。约15%的ICD受者同时接受抗心律失常药物(antiarrhythmic drugs, AAD)治疗,并且在前5年内有38%的患者的ICD针对VT有过放电<sup>[4-5]</sup>,而ICD的放电也会给患者带来痛苦。AAD中常用药物有索他洛尔和

胺碘酮,长期应用AAD需注意其副作用,如索他洛尔可导致QT间期延长,一般仅限于肾功能不全患者;胺碘酮有多器官毒性,如甲状腺功能损害、肺毒性、肝功能损伤和致心律失常等,因此停药率显著<sup>[6-8]</sup>。虽然AAD可减少ICD放电次数,但由于其副作用,一般在开始使用后1年内停用<sup>[7]</sup>。而AAD和ICD的应用均未显示可降低死亡率,并且胺碘酮可能会增加NYHAⅢ级心力衰竭患者的死亡率<sup>[6]</sup>。导管消融用于MI后VT的治疗已有三十多年,它可直接对VT基质进行消融,降低了MI后VT的复发风险<sup>[9]</sup>,改善患者的生活

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质量,并且随着消融技术的不断进步,导管消融已成为 MI 后 VT 治疗的合理选择<sup>[10-12]</sup>,而且越来越多的指南共识中也对导管消融进行了详细描述。

现就 MI 后 VT 患者导管消融的适应证在各指南和共识中的演变加以综述,通过对进展的追踪,希望对相关领域工作者在导管消融治疗的选择上提供帮助。所选的文献主要是由美国心脏病学会(ACC)、美国心脏协会(AHA)、欧洲心脏病学会(ESC)、欧洲心律协会(EHRA)、心律协会(HRS)、亚太心律协会(APHRS)和拉丁美洲心律协会(LAHRS)等合作发布的指南或共识。

## 1 主要指南和共识的变迁

21 世纪初,由于消融和标测技术等仍处于发展阶段,而且导管消融在 MI 后 VT 中的应用仍缺乏循证研究的支持,因此在《2006 年 ACC/AHA/ESC 室性心律失常治疗和心脏性猝死预防指南》中,仅对 MI 后左室功能障碍的治疗中提到<sup>[13]</sup>:ICD 的辅助治疗,包括导管消融或手术切除,以及用胺碘酮或索他洛尔等药物进行药物治疗,对于改善因 MI 所致左室功能障碍患者频繁发生持续性 VT 或心室颤动所引起的症状是合理的(Ⅱa,C)。

随着消融技术和三维电解剖标测系统的广泛应用<sup>[14-16]</sup>和标测技术<sup>[17-18]</sup>等技术的改进,对 MI 后 VT 发生的机理认识更加深入,并有多中心实验结果支持<sup>[19-20]</sup>,因此《2009 年 EHRA/HRS 室性心律失常导管消融专家共识》更具有针对性地将 MI 后 VT 的适应证进行归类指出<sup>[21]</sup>,对于结构性心脏病(包括前期 MI)所致 VT 患者,推荐进行导管消融的情况有:(1)有症状的持续单形性 VT(sustained monomorphic VT,SMVT),包括 ICD 终止的 VT,反复发作,且 AAD 无效,或不能耐受,或不接受药物治疗;(2)用于控制连续 SMVT 或 VT 电风暴的发生;(3)VT 发作可能导致心室功能障碍的患者;(4)束支折返或束间折返引起的 VT;(5)AAD 难以控制的复发的持续多形性 VT 和心室颤动。应考虑导管消融治疗的情况有:(1)使用一种或多种 I 类或Ⅲ类 AAD 进行治疗仍发生一次或多次 SMVT 的患者;(2)前期 MI 后复发的 SMVT,左室射血分数 $>0.30$  且预期生存 1 年的患者中,可作为胺碘酮治疗的替代方案;(3)前期 MI 但左室射血分数尚可( $>0.35$ ),发生血流动力学稳定的 SMVT 患者,即使 AAD 治疗仍有效也可考虑进行导管消融(此版专家共识推荐等级分为:推荐、应考虑和禁忌三个等级)。

随着一些前瞻性研究,如 VATCH 等研究<sup>[22]</sup>的完成,对于 MI 后 VT 的导管消融治疗有了更加详细的证据支持,因此《2015 年 ESC 室性心律失常处理和心脏

性猝死预防指南》<sup>[23]</sup>也对 MI 后的 VT 进行了详尽介绍,这版指南是对《2006 年 ACC/AHA/ESC 室性心律失常治疗和心脏性猝死预防指南》的欧洲更新,指南中指出:(1)对于伴有持续性 VT 或电风暴的瘢痕相关性心脏病患者,建议紧急行导管消融术(I,B);(2)缺血性心脏病患者由于持续性 VT 后出现 ICD 反复放电,建议导管消融(I,B);(3)对患有缺血性心脏病并植入 ICD 的患者,在持续性 VT 首次发作后应考虑行导管消融(Ⅱa,B)。

VANISH 和 CALYPSO 等研究<sup>[24-26]</sup>的相继完成,使得《2017 年 AHA/ACC/HRS 室性心律失常处理和预防心脏性猝死指南》中 MI 后 VT 的导管消融治疗更加具体,推荐级别和证据等级更加细化,这版指南也是对《2006 年 ACC/AHA/ESC 室性心律失常治疗和心脏性猝死预防指南》的更新,指南中指出<sup>[27]</sup>:(1)患者在 MI 后出现反复发作的症状性持续性 VT,或出现 VT 电风暴且应用胺碘酮复律失败(I,B-R),或应用其他 AAD 失败(I,B-NR),建议行导管消融;(2)对于患有缺血性心脏病,虽反复发作但血流动力学稳定的 SMVT 或有症状的 SMVT 且 ICD 频繁放电的患者,可考虑导管消融作为一线治疗以减少 VT 发作(Ⅱb,C-LD)(注:B-R 表示来自于随机研究;B-NR 表示来自于非随机研究;C-LD 表示来自于有限的研究数据)。

《2019 HRS/EHRA/APHRS/LAHRS 室性心律失常导管消融专家共识》是对《2009 年 EHRA/HRS 室性心律失常导管消融专家共识》的更新,也是对《2017 AHA/ACC/HRS 室性心律失常患者处理和心源性猝死预防指南》和《2015 年 ESC 室性心律失常患者处理和心脏性猝死预防指南》的补充,综合了新的研究成果<sup>[28-30]</sup>。与上述指南相比,该共识涉及范围更窄,针对性更强,对 VT 导管消融的适应证、推荐级别和证据等级方面均有更加深入的研究。共识指出<sup>[31]</sup>:(1)对于缺血性心脏病长期应用胺碘酮仍不断发生单形性 VT 的患者,导管消融治疗优于不断升级的 AAD 治疗(I,B-R);对于 AAD 治疗仍有临床症状或发生电风暴的患者,推荐应用导管消融治疗(I,B-NR);(2)对于缺血性心脏病发生单形性 VT 但不耐受或不适合 AAD 治疗的患者,推荐应用导管消融(Ⅱa,C-EO);(3)对缺血性心脏病首次发生单形性 VT 并接受 ICD 治疗的患者,行导管消融治疗能使 VT 复发的时间延长,且减少了 ICD 放电的次数(Ⅱb,A);对于稳定发作的 VT 患者,如心内膜下消融失败,可行心外膜消融(Ⅱb,C-LD)(注:C-EO 表示来自于专家共识)。

## 2 总结与展望

上述指南和共识中对于 MI 后 VT 导管消融的适

应证、推荐级别和证据等级的不断演变中可得出结论:随着对 MI 后 VT 发病机制的深入研究,消融技术和标测系统等<sup>[32-34]</sup>的进步,以及更加系统详尽的随机对照研究的结果披露,MI 后发生单形性 VT 应用 AAD 效果不佳时,或发生电风暴时,积极推荐导管消融治疗,而对于接受 ICD 治疗的患者,导管消融能延长 VT 的复发时间,并减少 ICD 的放电次数,提高患者的生活质量。

从指南的变迁也可看出,MI 后 VT 患者射频消融的各种方法的出现都源自于对 VT 发生本质认识的不断深入。由于 MI 后 VT 属于瘢痕相关 VT 的范畴,其发生主要依赖于大的折返。MI 后会导致部分心肌异常,如致密纤维脂肪组织引起解剖传导阻滞,成活心肌细胞间的纤维化降低了细胞间偶联,传导路径的改变引起传导减慢等,这些改变都构成了折返形成的条件。而形成的折返环的大小、形态和位置等往往都复杂多变<sup>[35]</sup>,因此 MI 后 VT 的精确标测对于定义最佳消融靶点至关重要。目前 VT 的标测方式主要有激动、起搏、拖带和基质标测等。激动标测可根据标测结果直观判断折返路径和关键通道;起搏和拖带标测主要是通过拖带 VT 后的 QRS 波群形态、起搏后间期值以及刺激到 QRS 波群间期与心动过速周长的比值来判断起搏位点在折返环中所处的位置;基质标测就是对 VT 形成环境的标测,可揭示 VT 形成的机制。由于基质标测无需诱发 VT,在窦性心律下就可进行,对于血流动力学不稳定的 VT 发作尤为适用,这也是基质标测的一大优势,主要包括电压标测、晚电位标测、缓慢传导区标测和其他特殊电位(LAVA 电位)标测等。有研究表明窦性心律下缓慢传导区可预测 VT 消融终止区,证明缓慢传导区与 VT 高度相关,是折返的关键通道<sup>[36]</sup>。目前临床常用的三维标测可针对瘢痕区定位并识别靶点<sup>[37]</sup>,为消融指明方向。基质标测因其标测相对简单,容易实现,也成为 MI 后 VT 标测的重要方法。

MI 后 VT 的导管消融仍有一些难题需攻克,消融相关死亡率为 3%,并发症发生率为 5%~7%<sup>[24,26,38]</sup>。导管消融常规位于心内膜下,故对深层的折返基质受诸多限制。针对这些问题也有许多新方法涌现,如双极消融在损伤透壁方面更具优势<sup>[39]</sup>,还有新型导管的出现,如可伸缩的针状消融导管<sup>[40-41]</sup>,也有研究在电风暴患者行导管消融时应用体外膜肺氧合行心肺支持以提高手术成功率和患者生存率<sup>[42]</sup>。

2019 年欧洲心律协会对导管消融研究的最新报道中也指出,目前已有电极面积微小但电极密度紧凑的多极标测导管,其基本原理是通过提高标测密度和

精度来提高对潜在 VT 基质的认识<sup>[43]</sup>。多中心观察性研究也表明,应用影像集成,如磁共振成像和 CT 等,可辅助关键峡部的详尽标测或消融,可帮助识别异常基质区域,从而提高手术效率,可详细描绘重要结构如冠状动脉和神经等提高手术安全性。尽管新技术的应用取得了一些进展,但仍需进一步的研究来证明其安全性和有效性。

总之,在 MI 后 VT 的治疗中,指南在导管消融的推荐上比较积极,并且对于 AAD 治疗无效或不耐受以及减少 ICD 放电方面,更能体现其优越性,同时 AAD 和 ICD 的治疗也未能从基质上治疗 VT,因而在 MI 后 VT 的急性期和长期治疗中,导管消融的地位作用越来越重要,更受指南和共识的推荐,值得临床医师的关注。

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