

左房低电压与心房颤动相关性的研究进展

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【摘要】 心肌纤维化与心房颤动(房颤)可相互影响,互为因果,电解剖标测系统显示的左房低电压提示左房纤维化。近年来大量研究表明左房低电压可显著增加房颤术后的复发风险。研究显示在阵发性房颤患者中,肺静脉隔离附加左房低电压区消融是否更有效存在争议;在持续性房颤患者中,肺静脉隔离附加左房低电压区消融可显著降低房颤的复发风险。此外,左房低电压也可提示房颤患者有脑梗死病史及沉默性脑梗死的发生。现针对近年来左房低电压与房颤相关性的研究进展做一综述。

【关键词】 左房低电压;心房颤动;导管消融

【DOI】10.16806/j.cnki.issn.1004-3934.2022.03.005

The Correlation Between Left Atrial Low-Voltage and Atrial Fibrillation

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【Abstract】 Myocardial fibrosis and atrial fibrillation can interact and cause each other. The left atrial low-voltage area displayed by electroanatomical mapping system indicates left atrial fibrosis. In recent years, a large number of studies have shown that left atrial low-voltage area can significantly increase the risk of postoperative recurrence of atrial fibrillation. Studies have shown that in patients with paroxysmal atrial fibrillation, it is controversial whether pulmonary vein isolation plus left atrial low-voltage ablation is more effective. In patients with persistent atrial fibrillation, pulmonary vein isolation combined with left atrial low-voltage ablation can significantly reduce the risk of recurrence of atrial fibrillation. In addition, left atrial low-voltage area can also predict the history of cerebral infarction and the risk of silent cerebral infarction in patients with atrial fibrillation. This paper reviews the research progress on the correlation between left atrial low-voltage area and atrial fibrillation in recent years.

【Key words】 Left atrial low-voltage; Atrial fibrillation; Catheter ablation

心房颤动(房颤)是临床上最常见的持续性心律失常,心房纤维化与房颤可相互影响,互为因果。有研究发现高心房率会使心房内胶原蛋白-1及纤维连接蛋白-1的表达增加^[1],从而导致心肌纤维化。心房纤维化也可改变电活动的传导,从而参与房颤的维持机制^[2]。既往临床上常通过心脏磁共振中的钆延迟显像来评估心肌纤维化的程度,最近有研究表明电解剖标测系统中电压标测显示的左房低电压与心脏磁共振中的钆延迟显像具有很好的相关性^[3]。且有研究发现左房低电压的存在可显著增加房颤的复发风险^[4],在肺静脉隔离基础上附加左房低电压区消融可增加房颤导管消融术后的窦性心律维持率^[5]。

1 左房低电压的定义

有20%~25%的房颤患者存在左房低电压区,持续性房颤患者的左房低电压发生率及面积均高于阵

发性房颤患者,低电压区常出现在左房前壁、房间隔及左房后壁^[6-7]。大多数研究对左房低电压的截断值定义为窦性心律时标测的双极电压 ≤ 0.5 mV。最近有研究显示房颤心律下进行电压标测也是可行的,只是与窦性心律标测截断值不同,该研究发现以传统窦性心律下左房电压 ≤ 0.5 mV为参考标准时,房颤心律对低电压区的截断值为 < 0.2 mV^[8]。另一项研究^[9]也是以窦性心律下 ≤ 0.5 mV为参考标准,发现房颤心律对低电压区的截断值为 < 0.24 mV。因此,如果一些持续性房颤患者在导管消融术中无法转为窦性心律,那么房颤心律下进行电压标测也是可行的,但截断值仍需大样本研究进一步评估。

2 左房低电压与房颤复发

导管消融术是房颤患者控制节律的一线治疗,但术后存在较高的复发风险,综合评估房颤复发的危险

基金项目:湖南省医药卫生科研项目(572299)

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因素对于选择合适的治疗方式极为重要。近年来大量研究表明左房低电压也为房颤复发的危险因素之一, Begg 等^[10]对 92 例房颤患者随访 1 年发现, 无论在窦性心律下或是房颤心律下标测, 左房低电压均可增加房颤术后的复发风险。

Gramlich 等^[4]在 60 例持续性房颤患者中研究发现, 房颤术后 12 月患者窦性心律维持率随左房低电压面积的增加而逐渐减低。Yamaguchi 等^[11]在 172 例持续性房颤患者中也证明了左房低电压为房颤术后复发的独立危险因素。除持续性房颤患者外, 也有学者研究了左房低电压对阵发性房颤患者的影响, 其中 Masuda 等^[12]在 147 例阵发性房颤患者中发现, 有 15% 的患者存在左房低电压区, 平均随访 22 个月, 在校正其他房颤复发的危险因素后, 左房低电压区仍可显著预测房颤的复发 ($HR = 5.89, P = 0.001$)。Wang 等^[13]在 150 例阵发性房颤患者中也发现, 左房低电压的面积是阵发性房颤患者导管消融术后复发的独立预测因素 ($HR = 1.633, P = 0.011$)。综上所述, 无论是在阵发性房颤或是在持续性房颤患者中, 左房低电压均可增加房颤患者导管消融术后的复发风险。

3 左房低电压区消融治疗房颤

3.1 左房低电压区消融治疗阵发性房颤

Zhou 等^[14]在 147 例存在左房低电压区的房颤患者中研究发现, 肺静脉隔离附加左房低电压区消融术后 1 年的窦性心律维持率显著高于单独行肺静脉隔离的房颤患者, 其窦性心律维持率与无左房低电压区的房颤患者相似, 表明左房低电压区消融是有效的。然而最近 Masuda 等^[15]对 398 例阵发性房颤患者在肺静脉隔离后行电压标测, 其中 336 例无左房低电压, 将 62 例存在左房低电压的患者随机分为左房低电压区消融组及左房低电压区未消融组, 随访 1 年发现, 虽然左房低电压可显著增加房颤复发风险, 但左房低电压区消融并不能降低房颤复发率。目前关于阵发性房颤患者中左房低电压区消融是否可降低房颤复发风险的相关研究较少, 且结论存在争议, 需临床研究进一步证实。

3.2 左房低电压区消融治疗持续性房颤

既往研究^[16]表明与阵发性房颤相比, 持续性房颤患者的心房纤维化范围更大, 且心房纤维化在持续性房颤的维持中起重要作用。Jadidi 等^[17]将 134 例持续性房颤患者分为肺静脉隔离附加左房低电压区消融组 ($n = 67$) 和肺静脉隔离组 ($n = 66$), 平均随访 13 个月, 研究发现肺静脉隔离附加左房低电压区消融组的窦性心律维持率显著高于肺静脉隔离组 ($69\% \text{ vs } 47\%, P < 0.001$)。Yamaguchi 等^[18]在 117 例持续性房颤患者中除发现存在左房低电压的患者行肺静脉

电隔离附加左房低电压区消融术后 18 个月窦性心律维持率显著高于存在左房低电压区只行肺静脉电隔离术的患者 ($72\% \text{ vs } 38\%$) 外, 还发现其与无左房低电压区而只进行肺静脉隔离的患者术后窦性心律维持率无明显差别。此外, 最近 Nery 等^[5]在 145 例持续性房颤患者中研究发现, 肺静脉隔离附加左房低电压区消融虽然会增加手术时间, 但明显降低术后 18 个月的复发风险, 多元回归分析显示附加左房低电压区消融是房颤复发唯一的保护因素, 且无与左房低电压区消融相关的不良事件发生。以上研究表明在持续性房颤患者中, 肺静脉隔离附加左房低电压区消融可增加房颤患者术后的窦性心律维持率。

Yang 等^[19]在一项纳入 229 例非阵发性房颤患者的多中心随机对照研究中发现, 虽然在传统消融方式的基础上附加左房低电压区消融有降低房颤复发风险的趋势, 但并无统计学意义, 可能与纳入人群年龄较低 (平均年龄为 57 岁), 左房状态较好有关 (平均左房内径为 41 mm), 这些增加了传统消融组的术后成功率, 且传统消融组术中根据患者情况附加了左房顶部、二尖瓣环峡部、三尖瓣环峡部及碎裂电位的消融。Kumagai 等^[20]在 115 例持续性房颤患者中也发现, 在肺静脉隔离 + 左房后壁隔离基础上, 是否附加左房低电压区消融并不会显著影响患者术后的窦性心律维持率。

4 左房低电压与房颤患者缺血性脑卒中相关性

房颤可显著增加缺血性脑卒中的发生风险, 非瓣膜性房颤患者缺血性脑卒中的发生风险是一般人群的 5 倍, 目前临床上常用 $CHA_2DS_2\text{-VASc}$ 评分来为房颤患者进行缺血性脑卒中的危险分层, 然而这一评分系统缺乏反映心房重构的指标, 而心肌纤维化也可参与房颤患者的卒中发生^[21]。有一项研究^[22]在 40 例房颤患者中发现, 术后出现沉默性脑梗死患者的左房低电压区的面积更大 [$(24.0 \pm 11.2)\% \text{ vs } (3.5 \pm 4.2)\%, P < 0.0001$], 表明左房重构与房颤导管消融后沉默性脑梗死的发生显著相关。随后 Müller 等^[23]在 200 例房颤患者中不仅发现存在脑梗死病史以及沉默性脑梗死的房颤患者中左房低电压区的面积更大, 且校正 $CHA_2DS_2\text{-VASc}$ 评分后左房低电压仍为房颤患者存在脑梗死病史和沉默性脑梗死的独立危险因素。综上所述, 存在左房低电压区的房颤患者更容易存在脑梗死病史, 且这些房颤患者导管消融术后沉默性脑梗死的发生率也显著增加, 但左房低电压区是否可增加房颤患者远期脑梗死的发生风险目前仍无相关研究。

5 预测房颤患者左房低电压的指标

左房低电压可预测房颤复发已被多项研究证实, 但左房低电压只能在术中通过电解剖标测系统测得,

近年来有研究探索左房低电压的无创预测指标。Schreiber 等^[24]研究发现心电图上的 P 波振幅与左房低电压的面积呈负相关,而 P 波时限与左房低电压面积呈正相关。最近的一项研究^[25]也证明了 P 波振幅是左房低电压的强大预测指标。除了心电图中的 P 波外,一些研究发现反映左房结构及功能的一些指标也可预测房颤患者的左房低电压,包括左房壁厚度、左房容积、左房射血分数及导管消融术前心脏超声测得的舒张早期二尖瓣血流峰值流速与二尖瓣环峰值运动速度比值^[7,26-28]。此外,一些研究发现患者的临床资料,包括年龄、女性、持续性房颤、瓣膜性心脏病以及 CHA₂DS₂-VASc 评分 ≥ 4 分也与房颤患者存在左房低电压区显著相关^[7,27-29]。

综上所述,左房低电压与左房纤维化密切相关,可显著增加房颤患者导管消融术后的复发风险,对于存在左房低电压区的持续性房颤患者,在肺静脉隔离的基础上附加左房低电压区消融可增加患者术后的窦性心律维持率。左房低电压区不仅可预测房颤的复发,也与房颤患者沉默性脑梗死的发生显著相关。预测房颤患者左房低电压区的无创指标包括 P 波时限及振幅、左房大小及功能以及一些临床特点。不同研究对于左房低电压区的消融策略不尽相同,有些对左房低电压区进行均质化消融,而有些则根据左房低电压区的面积来决定对左房低电压区进行逐点消融或是将左房低电压区环状消融以达到电隔离,不同消融方式之间的效果是否存在差异仍需临床研究进一步探讨。

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