· 临床病理讨论 ·

Clinicopathological Conference (the 45th case)

Electrocardiogram features and percutaneous coronary intervention strategy of left main coronary artery occlusion in an elderly male patient

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Case Presentation

A male patient, 79 years old, complained of sudden attack of chest oppression and respiratory distress of unknown cause starting four hours prior to his admission to the Institute of Geriatric Cardiology, Chinese PLA General Hospital. The patient still presented with chest pain on admission. Electro- cardiogram (ECG) was recorded at the onset of chest pain(Figure 1). His chest pain was relieved by symptomatic treatment. He had a 8-year history of hypertension, which got satisfactory control currently. The patient also had a 9-year history of cerebral infarction with right hemiplegia as a sequel. On admission, the patient was conscious, with the blood pressure = 140/90mmHg, and moist rales heard over both lung fields. He also suffered from mild edema of the lower limbs. Physical examination revealed normal pedal pulsation and 3-degree muscular strength in his right limbs. After admission, the patient presented with repeated chest pain and breath shortness. The cardiac tropinin T(cTnT) was 2.52 μg/L. The echocar- diogram showed dyskinesia of the anterior wall of left ventricule, and the left ventricular fraction(LVEF) was 30%. So, the patient was diagnosed as acute non-ST segment elevation myocardial infarction(NSTEMI) and heart failure. The patient's condition got stable gradually after he received intra-aortic ballon pump(IABP) implantation. On the third day after admission, the patient underwent coronary angiography(CAG) and percutaneous coronary intervention (PCI) with IABP providing myocardial protection. The CAG showed 70% stenosis in the bulk and bifurcation of the left main coronary artery, with the ostium of the left descending artery (LAD) and the left circumflex coronary artery(LCX) involved, 70%-90% stenosis in the middle of LAD, and 85% stenosis in the ostium and proximal part of LCX, with the ostium of obtuse marginal branch involved(Figure 2A). IABP was removed 7 days after the surgery and the postoperative course was uneventful.

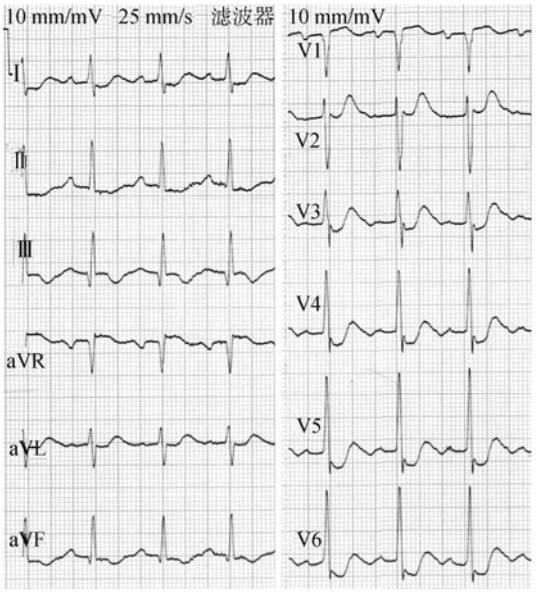

Figure 1 Electrocardiogram at onset of anginal pain

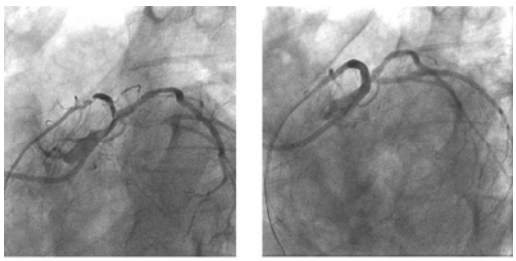

Figure 2 Coronary angiography before(A) and after(B) stents implantation

Clinical discussion

Dr. ZHU Mei: This patient was admitted to our hospital due to "sudden chest oppression and respiratory distress". He denied previous histroy of chest oppression and breath shortness. ECG on admission showed ST-segment depression in leads Ⅰ, Ⅱ, aVL, aVF, and V_3-V_6, and the cTnT was 2.52μg/L, so the diagnosis of NSTEMI was confirmed. The patient's cardiac dysfunction was relieved by IABP implantation, which prepared the patient for PCI. This patient was in old age, and had cardiac dysfunction

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and previous history of hypertension and old cerebral infarction. The ECG also indicated left main occlusion. All these put the patient at higher risk for PCI or coronary artery bypass grafting(CABG). Besides, he was free from diabetes. So, we tended to prefer PCI for this patient.

Dr. CHEN Qi: In this patient, ECG indicated left main involvment. Usually, the acute myocardial infarction caused by left main occlusion establishes the most dangerous situation in the patient, and most of the patients were brought already in dead to hospital. For these patients, the situation scarcely allowed recording of ECG signal, except for the subtotal occlusion, subacute occlusion or total occlusion with formation of bridging lateral branch. The main ECG features were as follows. (1)Left main occlusion means LAD occlusion plus LCX occlusion. Left main occlusion can be confirmed by evidence of LAD occlusion and LCX occlusion revealed by ECG. LAD occlusion manifested as anterior or extensive anterior wall infarction, and LCX occlusion mani- fested as: ①lateral or inferior-lateral wall infarction: ST-segment elevation in lead V_7-V_9 or slight ST-segment elevation in V_1-V_3(sum of ST-segment elevation <0.5mV); ②inferior wall infarction (LCX occlusion): ST-segment elevation in lead Ⅱ,Ⅲ and aVF, and ST segment elevation in lead Ⅱ is greater than that in lead Ⅲ(ST_{II}↑>ST_{III}↑); ③atrial infarction: PTa depression>0.05mV in lead Ⅱ, Ⅲ, aVF, V_1, and V_2, and PTa elevation>0.05mV in lead aVR, aVL, V_5, and V_6; ④ST segment elevation in lead V_6 is equal to or greater than that in lead V_1(ST_{V_6}↑/ST_{V_1}↑≥1). (2)ST_{aVR}↑>ST_{V_1}↑. In cases with myocardial ischemia caused by left main coronary occlusion, ST-segment elevation could be found both in lead aVR and lead V_1, and the amplitude of ST elevation in lead aVR is greater than that in lead V_1 (ST_{aVR}↑>ST_{V_1}↑). It was ever reported that ST_{aVR}↑>ST_{V_1}↑ was observed in 81% patients with left main occlusion and in 20% patients with LAD occlusion, and the sensitivity and specificity of ST_{aVR}↑>ST_{V_1}↑ for left main occlusion was 81% and 80% respectively. (3)ST_{aVR}↑and ST_{aVL}↑. ST-segment elevation in both lead aVR and aVL (ST_{aVR}↑and ST_{aVL}↑) could be found in patients with left main occlusion, which is more frequent than in patients with proximal occlusion of LAD or LCX or RCA, and ST_{aVR}↑is greater than ST_{aVL}↑. The specificity of ST_{aVR}↑and ST_{aVL}↑ for left main occlusion was 98%. ST_{aVR}↑and ST_{aVL}↑is an important predictor of death in these patients. (4)Widespread ST-segment depression (both in lead Ⅰ and Ⅱ). The widespread ST-segment depression in lead Ⅰ, Ⅱ and V_4-V_6 is another typical ECG finding. The lead V_4-V_6 corresponds to anterior-lateral wall, lead Ⅰ to the lateral wall, and lead Ⅱ to inferior wall, so ST depression in all of these leads indicates the extensive ischemia in whole left ventricle. It is suggestive of left main occlusion that the number of leads with ST depression≥5, and≥8 has stronger diagnostic significance. In case of left main occlusion, degree of ST depression is about 0.5-2.5mm in most of the limb leads and≥2mm in lead V_4-V_6 (≥4mm is more significant).

Dr. LI Yufeng This patient had ST-segment depression in lead Ⅰ, Ⅱ, aVL, aVF, and V_3-V_6 at the chest pain onset, which is the typical features suggestive of left main occlusion. And the coronary angiography re-established the diagnosis of left main occlusion. While, these ECG pattern can also appear in patients with triple-vessel disease. So, the differenttiation of left main occlusion from triple- vessel disease deserves great attention. Currently, the typical ECG images for patients with total left main occlusion or subtotal left main occlusion have been well recognized with comparison of coronary angiography. These patients can receive treatment timely.

Dr. XUE Qiao In acute coronary syndrome patients, left main occlusion accounts for about 4%–6%. According to previous ACC/AHA guidelines, coronary artery bypass graft (CABG) was recom- mended as standard therapy, while PCI as the third indication for left main occlusion. Nevertheless, more and more evidences support that PCI has good safety and efficacy for patients with left main occlusion, and in new ACC/AHA guidelines, PCI is recommended as the second indication for left main occlusion. Taking this case into consideration, the experiences and rules in PCI performance for patients with unprotected left main trunk lesions were summarized as follows. (1) PCI had a higher risk in patients with LVEF < 40%. In case that PCI cannot guarantee coronary revascularization, CABG should be the first choice therapy. (2) Patient can benefit more when left main is anato- mically suitable for PCI, such as severe lesion calcification; (3) PCI should be seriously considered for patients with diabetes; (4) PCI is highly recommended in elderly patients, especially those with pulmonary dysfunction.

Dr. WANG Yu The treatment strategy selection needs equal attention. For non-bifurcation lesion of left main ostium and stem, the key points of PCI strategies include accurate placement of the stent, complete coverage of the lesion, and satisfactory stent support. For bifurcation lesion, single stent is always preferred, especially for diffuse disease. When two stents technique was used in case of bifurcation lesion of left main, the preservation of blood flow to side branch should be taken into consideration. As for this critically ill patient, who suffered from myocardial infarction with cardiac dysfunction, we first dealed with the proximal lesions in LAD (LEPU 2.5mm×9 mm) and LCX (FIREBIRD2 2.5 mm×3 mm) under IABP

support by using 6F EBU3.5 guiding catheter and PILOT 50 guide wire. And then, we applied two stents strategy for left main coronary stenosis. One stent (LEPU 3.0 mm×6 mm) was implanted in LAD and left main, and the other (XIENCE V 3.5 mm×2 mm) at the proximal left main (Figure 2B). Coronary angiography demonstrated satisfactory revascularization. IABP was stopped on the 7th day after PCI when the patient's heart function got better. At six-month follow-up, his condition was stable.

Currently, the Syntax score, as an angiographic classification scheme, is widely used to quantify the complexity of coronary artery disease, and to guide therapy strategy selection. PCI is preferred in patients with Syntax score< 23, while CABG in those with Syntax score≥33. But this score system does not consider the potential confounding factors, such as patient's age, hepatic function, renal function and heart function, the prior history of diabetes and/or stroke, and so on, while these are usually decisive factors predicting the outcome of PCI. So, as for severe LM occlusion, to achieve successful PCI performance, the patient's condition should be evaluated comprehensively, and intensive preoperative preparation be performed, including correction of cardiac function, protection of renal function, IABP support, *etc*. This case was in old age, had prior stroke history, and got diagnosis of NSTEMI with heart failure. The key point for successful PCI performance is to evaluate his clinical condition comprehensively and to simultaneously protect function of other organs, such as the liver, kidney, and brain.

The new ACC/AHA guideline widened the indications of PCI for patients with left main occlusion. And even in some cases, PCI may become the first choice strategy. ECG recorded at chest pain onset is helpful for identification of left main occlusion, which deserves attention. Additionally, rich experiences and perfect performance of the operator play central roles in PCI success, mortality reduction and long term outcome improvement in patients with left main occlusion.

(Translators: CHEN Qi, WANG Yu)

左主干病变心电图特点及介入治疗策略的选择：老年男性 1 例

1 病例摘要

患者，男，79 岁，因"突发胸闷憋气 4 h"入院。患者于入院前 4h 无明显诱因突发胸闷气短，患者入院时仍有胸痛发作，记录心电图(图 1)，经对症处理后胸痛缓解。既往有高血压病史 8 年，目前控制较理想。脑梗死病史 9 年，遗留右侧肢体偏瘫。入院时查体：神志清，血压 140/90 mmHg，双肺底可闻及湿啰音，双下肢轻度水肿，足背动脉搏动正常，右侧肢体肌力 3 级。患者于入院后反复出现胸痛伴呼吸困难，心肌肌钙蛋白 T(cTnT)2.52 μg/L，超声心动图提示：左室前壁运动减弱，LVEF 30%。诊断为急性非 ST 段抬高型心肌梗死(NSTEMI)，心功能 4 级，急性左心衰竭，给予植入 IABP，症状逐渐稳定。入院后第 3 天，患者在 IABP 保护下行冠脉造影及支架植入术。手术过程顺利，冠脉造影提示：左主干中段以远节段性狭窄 70%，累及前降支和回旋支开口。前降支开口及中段节段性狭窄 70%～90%，回旋支开口及近段节段性狭窄 85%，累及钝缘支开口(图 2A)。行 PCI 术，术后第 7 天顺利拔除 IABP，目前随访中，病情相对稳定。

2 临床病理讨论

朱梅主治医师： 本例患者因"突发胸闷憋气 4 h"入院，既往自述没有明显胸闷气短病史。入院时记录心电图示Ⅰ、Ⅱ、aⅤL、aⅤF、$Ⅴ_3$～$Ⅴ_6$导联 ST 段压低，结合 cTnT 升高至 2.52 μg/L，NSTEMI 的诊断成立。患者有心功能不全，植入 IABP 后心功能明显改善，为进一步行冠脉介入 (PCI) 治疗创造了机会。患者高龄男性，伴心功能不全、高血压及陈旧性脑梗塞病史。心电图表现提示左主干病变的可能性大，应尽早行 PCI 治疗或冠脉搭桥 (CABG) 手术，但任何一种方法，患者术中的危险性较高。考虑高龄、心功能较差，既往没有糖尿病病史，可以首先选择 PCI 术。

陈琪副主任医师： 本例患者胸痛时的心电图提示左主干病变，通常左主干完全闭塞造成心肌梗死时，患者的病情凶险，绝大多数死于院外，能记录到心电图者很少。记录到的心电图多数是左主干次全闭塞、亚急性闭塞或完全闭塞伴有较好的侧枝循环，其主要表现包括以下几方面。(1) 左主干闭塞=前降支+回旋支闭塞。心电图判断是否有左主干闭塞主要是寻找 LAD 闭塞合并 LCX 闭塞的证据。主要表现为前壁或广泛前壁心肌梗死合并：①侧下壁心梗：$ST_{V_7\sim V_9}$↑或 $ST_{V_1\sim V_3}$↑轻度抬高(总和<0.5mV)；②合并下壁心梗(LCX 闭塞所致)：$ST_{Ⅱ、Ⅲ、aVF}$↑，$ST_{Ⅱ}$↑> $ST_{Ⅲ}$↑；③合并心房梗死：表现为Ⅱ，Ⅲ，aVF，V_1，V_2 导联 PTa 段下移>0.05mV；aVR，aVL，V_5，V_6导联 PTa

段抬高>0.05mV; ④ST_{V_6}↑/ST_{V_1}↑≥1。(2) ST_{aVR}↑>ST_{V_1}↑。左主干病变引起心肌缺血时, ST_{aVR} 和 ST_{V_1} 均抬高, 但 ST_{aVR}↑>ST_{V_1}↑。Yamaji 等报道, 左主干闭塞组 ST_{aVR}↑>ST_{V_1}↑(81%)显著高于 LAD 组(20%), 其判断左主干闭塞的敏感性为 81%, 特异性为 80%。(3) ST_{aVR}↑和 ST_{aVL}↑。Kurism 等分析急性左主干闭塞者 ST_{aVR} 与 ST_{aVL} 全部抬高的比例显著高于其他 LAD, LCX 和 RCA 近端闭塞者, 其预测左主干闭塞的特异性达 98%, 同时又是预测死亡的重要指标。(4) 广泛导联的 ST 段压低(Ⅰ和Ⅱ导联压低共存)。主要为Ⅰ, Ⅱ, V_4～V_6 导联 ST 段压低。由于 V_4～V_6 导联对应于左室前侧壁, Ⅰ导联对应于高侧壁, Ⅱ导联对应于下壁, $ST_{Ⅰ}$↓和 $ST_{Ⅱ}$↓同时存在提示心肌缺血的范围较广。ST 段压低的导联数≥5 对诊断有一定价值, 超过 8 个导联更有诊断意义; 通常各导联 ST 段水平压低 0.5～2.5 mm, V_4～V_6 导联压低至少≥2 mm(≥4 mm 更有意义)。

李玉峰副主任医师: 本例患者心绞痛发作时出现Ⅰ, Ⅱ, aVL, aVF, V_3～V_6导联ST段压低。以上完全符合左主干病变的心电图特点, 冠脉造影也证实了心电图定位诊断。需要注意的是, 冠脉三支病变时也可能出现类似的心电图表现, 而较难鉴别, 也需要给予充分的重视, 如同左主干病变。目前, 在与冠脉造影结果相对照的情况下, 人们逐渐认识了左主干高度狭窄/次全闭塞所致的特征性心电图改变(非传统的心电图定位诊断), 为及时救治此类患者提供了重要的依据。

薛桥副主任医师: 左主干病变约占冠心病患者的 4%～6%, 以往的指南将冠状动脉旁路移植术(CABG)列为标准治疗, 而 PCI 列为Ⅲ类适应证。然而, 目前越来越多的研究支持 PCI 治疗左主干病变安全且有效性高, 而更新的 ACC/AHA 指南更是将 PCI 术治疗左主干病变拓宽为Ⅱb 类适应证。以下结合本例, 简介无保护左主干 PCI 术应注意的处理原则与经验。需要注意患者的选择: (1) 临床情况: 左室射血分数<40%的患者行 PCI 术的风险较高, 如 PCI 治疗无法保证完全血运重建, CABG 仍应作为首选治疗; (2) 应选择左主干的解剖结构(如高度钙化病变)适合行 PCI 术者; (3) 合并糖尿病者 PCI 治疗应当慎重; (4) 高龄(例如肺功能较差)患者可能更适于行 PCI 治疗。

王禹主任医师: 同时需要注意治疗策略的选择。对于左主干开口和体部的非分叉病变, 主要要求是支架的准确定位、病变完全被覆盖和支架的良好支撑。对于分叉病变, 应首选单支架植入, 病变范围弥漫时更适合应用。需要采用双支架治疗左主干分叉病变时, 两支架重叠处应避开另一开口, 以免影响边支的血流。本例患者病情危重, 心肌梗死伴心功能不全, IABP 辅助循环, 首先处理前降支和回旋支近段病变, 以 6F EBU3.5 指引导管到达左冠状动脉开口, 采用 PILOT 50 导丝分别保护回旋支病及前降支, 分别在回旋支近段病变处植入 FIREBIRD2 2.5 mm×3 mm 支架, 在前降支中段病变处植入乐普 2.5 mm×9 mm 支架。随后选择双支架治疗分叉病变, 以 INVATEC 2.5 mm×20 mm 球囊到达左主干-前降支近段病变处, 以 16 atm 扩张, 共 2 次, 以乐普 3.0 mm×36 mm 支架植入病变处, 压力 18 atm, 以 GRIP 3.0 mm×8 mm 球囊行后扩张, 压力 20 atm, 重复造影, 支架膨胀良好, 血流通畅。后以 XIENCE V 3.5 mm×2 mm 支架植入左主干, 覆盖左主干近端病变, 造影示支架膨胀良好, 血流通畅(图 2B)。

目前, 临床使用的 Syntax 评分系统完全根据冠脉造影显示的病变狭窄程度评价包括左主干在内的复杂病变, 进而选择治疗策略, 其中 Syntax 评分 23 分以下者首选 PCI, 33 分以上者选择 CABG, 但此种评分完全未考虑到患者的年龄、肝肾肺功能及心功能情况, 患者有无糖尿病或中风等, 而这些重要的临床情况却经常是决定复杂左主干病变患者的 PCI 术疗效及预后的重要因素。因而, 对于严重左主干病变, 必须严格评价患者的整体临床情况, 包括各脏器功能, 并积极进行各种辅助准备(纠正心功能、水化保护肾功能、IABP 保护心功能等), 其有助于协助完成左主干介入治疗。本例为高龄(80 岁)患者, 有脑梗塞病史, 诊断为 NSTEMI 伴心衰, 正确评估其整体临床情况并采取保护重要器官功能的措施是顺利完成左主干 PCI 术的关键。

总之, 目前的 ACC/AHA 指南扩大了 PCI 术治疗左主干病变的适应证, PCI 术甚至成为某些情况下左主干病变优先选择的治疗方法。临床医生应重视左主干闭塞时的心电图表现, 尽早加以识别, 并积累左主干 PCI 术的经验, 提高手术操作水平, 进而提高 PCI 术的成功率, 降低患者的死亡率并改善远期预后。

(参加讨论医师: 朱 梅, 陈 琪, 李玉峰, 薛 桥, 王 禹)

(陈 琪, 王 禹整理)