

· 临床研究 ·

老年患者冠状动脉慢性完全闭塞病变正向技术开通的影响因素

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【摘要】目的 探讨老年患者冠状动脉慢性完全闭塞(CTO)病变应用正向技术开通成功的相关因素。**方法** 回顾性收集 2013 年 1 月至 2014 年 12 月在沈阳军区总医院心内科采用正向技术经皮冠状动脉介入(PCI)治疗的老年冠状动脉 CTO 患者 301 例。根据手术是否成功将患者分为 PCI 成功组 250 例及 PCI 失败组 51 例。收集并比较入选患者的基本资料、临床特征及住院期间不良事件发生情况。采用 SPSS 21.0 软件进行统计学分析。根据数据类型, 组间比较采用独立样本 *t* 检验或 χ^2 检验。二元 logistic 回归分析影响老年冠状动脉 CTO 病变开通成功的相关因素。**结果** 入选患者手术总体成功率 83.1% (250/301)。2 组患者在体质量、体质量指数、收缩压、糖尿病、吸烟、纽约心脏病学会(NYHA)分级、闭塞段扭曲、桥状侧支、闭塞时间分级和 CTO 靶血管等方面比较, 差异有统计学意义($P < 0.05$)。成功组和失败组在住院期间死亡率[0.8% (2/250) vs 1.9% (1/51)]、心力衰竭[4.4% (11/250) vs 3.9% (2/51)]、术后出血[3.2% (8/250) vs 3.9% (2/51)]、脑卒中[0% (0/250) vs 0% (0/51)]及围手术期心肌梗死[4.0% (10/250) vs 3.9% (2/51)]发生率比较, 差异无统计学意义($P > 0.05$)。二元 logistic 回归分析显示, 女性($OR = 5.608$, 95% CI 1.650 ~ 19.069, $P = 0.006$)、高收缩压($OR = 1.034$, 95% CI 1.004 ~ 1.064, $P = 0.024$)、急性心肌梗死(AMI)史($OR = 7.213$, 95% CI 1.070 ~ 48.645, $P = 0.042$)、靶血管为左前降支(LAD) ($OR = 2.943$, 95% CI 1.085 ~ 7.984, $P = 0.034$)及首先选用 Fielder XT 导丝($OR = 2.570$, 95% CI 1.049 ~ 6.296, $P = 0.039$)是增加正向技术开通老年冠状动脉 CTO 病变成功率的有利因素; 糖尿病($OR = 0.219$, 95% CI 0.086 ~ 0.562, $P = 0.002$)、既往肾功能不全($OR = 0.336$, 95% CI 0.117 ~ 0.967, $P = 0.043$)、NYHA 分级较高($OR = 0.238$, 95% CI 0.110 ~ 0.515, $P = 0.000$)、闭塞段扭曲($OR = 0.130$, 95% CI 0.017 ~ 0.969, $P = 0.047$)及桥状侧支($OR = 0.171$, 95% CI 0.046 ~ 0.634, $P = 0.008$)是降低正向导丝开通老年冠状动脉 CTO 病变成功率的不利因素。**结论** 既往有 AMI 史、靶血管为 LAD 的高收缩压老年女性患者首先选用 Fielder XT 导丝可增大正向技术开通冠状动脉 CTO 病变的成功率, 具有重要的临床参考价值。

【关键词】 老年人; 慢性完全闭塞病变; 经皮冠状动脉介入; 正向技术**【中图分类号】** R592; R541.4**【文献标志码】** A**【DOI】** 10.11915/j.issn.1671-5403.2018.11.190

Factors affecting successful recanalization of coronary chronic total occlusion with antegrade technique in the elderly patients

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【Abstract】Objective To investigate the factors affecting recanalization of coronary chronic total occlusion (CTO) using antegrade technique in the elderly. **Methods** A total of 301 CTO patients were recruited, who had undergone antegrade percutaneous coronary intervention (PCI) in the General Hospital of Shenyang Military Command from January 2013 to December 2014. According to whether the operation was successful, the patients were divided into PCI success group ($n = 250$) and PCI failure group ($n = 51$). Data were retrieved and compared of their basic information, clinical characteristics and adverse events. SPSS statistics 21.0 was used for statistical analysis. Depending on data type, independent samples *t*-test or Chi-square test was employed for comparison between groups. Binary logistics regression was performed to analyze the factors associated with success rate of CTO PCI. **Results** The overall success rate was 83.1% (250/301). There were significant differences between two groups in body mass, body mass index, systolic blood pressure (SBP), diabetes, smoking, New York Heart Association (NYHA) class, tortuosity in the occluded segment, bridging collateral vessels, occlusive time grading, and CTO target vessel ($P < 0.05$). There were no significant differences between two groups in mortality [0.8% (2/250) vs 1.9% (1/51)], heart failure [4.4% (11/250) vs 3.9% (2/51)], postoperative bleeding [3.2% (8/250) vs 3.9% (2/51)], stroke [0% (0/250) vs 0% (0/51)] and perioperative myocardial infarction [4.0% (10/250) vs 3.9%

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(2/51)] ($P > 0.05$)。Binary logistic regression analysis showed female ($OR = 5.608$, 95% CI 1.650 – 19.069, $P = 0.006$), high SBP ($OR = 1.034$, 95% CI 1.004 – 1.064, $P = 0.024$), previous acute myocardial infarction (AMI) ($OR = 7.213$, 95% CI 1.070 – 48.645, $P = 0.042$), left anterior descending (LAD) branch target lesion ($OR = 2.943$, 95% CI 1.085 – 7.984, $P = 0.034$), using the Fielder XT guidewire first ($OR = 2.570$, 95% CI 1.049 – 6.295, $P = 0.039$) were factors that increased procedural success rate; however, diabetes ($OR = 0.219$, 95% CI 0.086 – 0.562, $P = 0.002$), a history of renal insufficiency ($OR = 0.336$, 95% CI 0.117 – 0.967, $P = 0.043$), higher NYHA class ($OR = 0.238$, 95% CI 0.110 – 0.515, $P = 0.000$), tortuosity of the target vessel ($OR = 0.130$, 95% CI 0.017 – 0.969, $P = 0.047$) and bridging collateral vessels ($OR = 0.171$, 95% CI 0.046 – 0.634, $P = 0.008$) were factors decreasing procedural success rate. **Conclusion** The success rate of coronary CTO with antegrade technique increases in the elderly female with an AMI history, LAD target lesion, higher SBP, and using Fielder XT guidewire first, providing valuable clinical reference.

[Key words] aged; chronic total occlusion; percutaneous coronary intervention; antegrade technique

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冠状动脉慢性完全闭塞(chronic total occlusion, CTO)病变是指冠状动脉管腔完全闭塞,造影证实没有前向血流,即心肌梗死溶栓(thrombolysis in myocardial infarction, TIMI)临床试验血流分级为 0,且闭塞时间 ≥ 3 个月^[1]的病变。该病发生率占冠心病的 20%左右^[2,3]。研究表明,成功开通 CTO 病变能缓解心绞痛患者的胸痛症状,减少卒中、死亡和有冠脉旁路移植术(coronary artery bypass grafting, CABG)的需要^[4];同时可改善左心室的射血功能,降低再次心血管事件的发生率,改善生存率^[5]。经皮冠状动脉介入(percutaneous coronary intervention, PCI)治疗是用于冠状动脉 CTO 病变的手术疗法,如手术失败会增加术中的并发症及不良预后^[6]。近年来 PCI 开通冠状动脉 CTO 的成功率明显提高,部分术者 CTO 病变开通的成功率可达到 96%^[7]。PCI 已成为恢复冠状动脉 CTO 病变血流的主要手术方式。而老年 CTO 患者多伴有多个器官功能不全,对外科手术的耐受性差,因此,根据老年患者自身特点筛选出手术成功率高的 CTO 病变进行介入治疗尤为重要。本研究旨在通过回顾性分析采用正向技术行 PCI 治疗的冠状动脉 CTO 病变的老年患者资料,探讨影响老年患者冠状动脉 CTO 病变成功开通的危险因素。

1 对象与方法

1.1 研究对象

回顾性分析 2013 年 1 月至 2014 年 12 月在沈阳军区总医院心内科采用正向技术进行 PCI 治疗的老年 CTO 患者 301 例。其中男性 179 例,女性 122 例,年龄 65 ~ 88(72.0 $\pm$ 5.3)岁。入选患者的资料来自住院期间病历资料。入选标准:(1)确诊为冠状动脉 CTO 病变的老年(≥ 65 岁);(2)首次应用正向技术尝试开通 CTO 病变;(3)CTO 靶血管直径 ≥ 2.5 mm。排除标准:(1)存在 PCI 禁忌证;(2)严重

心功能不全或肝肾功能不全;(3)预计寿命 < 1 年。根据手术是否成功将患者分为 PCI 成功组 250 例及 PCI 失败组 51 例。PCI 成功定义为冠状动脉造影显示 PCI 术后残余狭窄 $< 20\%$,前向血流达到 TIMI 3 级,且无严重并发症。本研究经过沈阳军区总医院伦理委员会审核备案,所有入选患者术前均签署知情同意书。

1.2 方法

1.2.1 手术过程 所有手术均在局麻下应用目前标准的手术技术完成。手术穿刺路径:首选右侧桡动脉,次选左侧桡动脉、右侧股动脉或左侧股动脉。造影方式:多体位造影。指引导管:选择强支撑力的指引导管。选择 CTO 病变专用导丝,必要时选用微导管增加导丝的支撑力和穿透力。

1.2.2 资料收集 记录 2 组患者基线资料、临床特征及住院期间主要不良心血管病事件。基线资料包括患者年龄、性别、身高、体质量、血压、合并症及既往史等;临床特征包括术前检查(左心室射血分数、左心室舒张末内径、血肌酐、心胸比率)、病变特点(心功能分级、多血管冠心病、严重病变钙化、扭曲、桥状侧支、闭塞近端粗钝、闭塞时间、闭塞时间分级、侧支循环分级、CTO 靶血管)、特殊处理(首先选用 fielder XT 导丝)及术前用药(负荷阿司匹林、负荷氯吡格雷)。其中闭塞时间定义为从确诊发生闭塞到对闭塞相关冠状动脉进行 PCI 前的时间;侧支循环分级(Retrop scale)分为 0 级(不能观察到任何侧支循环通道充盈)、1 级(可见侧支循环充盈病变血管的分支,但不能充盈心外膜下血管段)、2 级(侧支循环充盈部分心外膜下血管段)及 3 级(侧支循环充盈整个心外膜下血管段)^[8];心功能分级采用美国纽约心脏病学会(New York Heart Association, NYHA)标准。主要不良心血管病事件包括死亡、心力衰竭、术后出血、脑卒中及围手术期心肌梗死等。

1.3 统计学处理

采用 SPSS 21.0 软件进行统计学分析。计量资料以均值 $\pm$ 标准差 ($\bar{x} \pm s$) 表示,组间比较采用独立样本 t 检验;计数资料以例数(百分率)表示,组间比较采用 χ^2 检验。采用二元 logistic 逐步回归分析影响正向技术成功开通冠状动脉 CTO 病变的危险因素。 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 2 组患者基线资料比较

手术总成功率 83.1% (250/301)。2 组患者在性别、年龄、身高、舒张压、高血压、既往病史和饮酒等方面差异无统计学意义 ($P > 0.05$),但在体质量、体质量指数、收缩压、糖尿病和吸烟等方面比较,差异有统计学意义 ($P < 0.05$;表 1)。

表 1 2 组患者基线资料比较

Table 1 Comparison of baseline data between two groups

Item	PCI success group ($n = 250$)	PCI failure group ($n = 51$)	P value
Age (years, $\bar{x} \pm s$)	71.7 $\pm$ 5.2	73.2 $\pm$ 5.2	0.066
Male [n (%)]	143 (57.2)	36 (70.6)	0.076
Height (cm, $\bar{x} \pm s$)	167.9 $\pm$ 7.2	168.4 $\pm$ 5.2	0.540
Body mass (kg, $\bar{x} \pm s$)	71.6 $\pm$ 9.9	75.1 $\pm$ 11.1	0.026
BMI (kg/m^2 , $\bar{x} \pm s$)	25.4 $\pm$ 3.0	26.5 $\pm$ 3.6	0.024
SBP (mmHg, $\bar{x} \pm s$)	142.8 $\pm$ 21.1	133.8 $\pm$ 18.2	0.005
DBP (mmHg, $\bar{x} \pm s$)	82.6 $\pm$ 14.3	80.4 $\pm$ 13.8	0.322
Hypertension [n (%)]	167 (66.8)	31 (60.8)	0.409
Diabetes [n (%)]	82 (32.8)	26 (51.0)	0.014
Previous diseases [n (%)]			
Stroke	26 (10.4)	6 (11.8)	0.773
OMI	81 (32.4)	21 (39.2)	0.228
AMI	20 (8.0)	4 (7.8)	0.970
PCI	66 (26.4)	12 (23.5)	0.670
Renal insufficiency	35 (14.0)	15 (29.4)	0.007
Smoking [n (%)]	107 (42.8)	33 (64.7)	0.004
Alcohol drinking [n (%)]	64 (25.6)	15 (29.4)	0.573

PCI: percutaneous coronary intervention; BMI: body mass index; SBP: systolic blood pressure; DBP: diastolic blood pressure; OMI: old myocardial infarction; AMI: acute myocardial infarction. 1 mmHg = 0.133 kPa

2.2 2 组患者临床特征比较

2 组患者 NYHA 分级、闭塞段扭曲、桥状侧支、闭塞时间分级和 CTO 靶血管比较,差异有统计学意义 ($P < 0.05$),其他方面变化不明显,差异无统计学意义 ($P > 0.05$;表 2)。

2.3 住院期间 2 组患者发生不良事件比较

成功组患者住院期间死亡率 0.8% (2/250),心力衰竭 4.4% (11/250),术后出血 3.2% (8/250),脑卒中 0% (0/250),围手术期心肌梗死 4.0%

(10/250);失败组患者上述不良事件发生率依次为 1.9% (1/51)、3.9% (2/51)、3.9% (2/51)、0% (0/51) 及 3.9% (2/51),2 组患者不良事件发生率比较,差异无统计学意义 ($P > 0.05$)。

2.4 正向技术成功开通冠状动脉 CTO 病变的影响因素分析

将所有因素纳入二元 logistic 回归中,经分析显示,女性、高收缩压、AMI、靶血管 LAD 及首先选用 Fielder XT 导丝是增加正向技术开通老年冠状动脉 CTO 病变成功率的有利因素;糖尿病、既往肾功能不全、NYHA 分级、扭曲及桥状侧支是降低正向导丝开通老年冠状动脉 CTO 病变成功率的不利因素,差异均有统计学意义 ($P < 0.05$;表 3)。

3 讨论

随着我国人口老龄化加剧,冠心病成了老年人健康的主要威胁,目前对冠状动脉 CTO 进行血运重建的方法有 CABG 和 PCI。PCI 以其创伤小、风险低、恢复快的特点成为被老年人广泛接受的手术方式。

有研究发现,女性或射血分数 $\geq 40\%$ 的患者,PCI 开通冠状动脉 CTO 病变时具有较高的成功率^[9],且女性出现冠状动脉 CTO 的年龄偏大^[10],因此在同年龄段的冠状动脉 CTO 病变中,女性闭塞的时间一般较短。同时有研究表明,闭塞时间与 CTO 开通成功率成负相关^[11],提示老年女性冠状动脉 CTO 病变开通成功率较男性高。较高的收缩压可提示有较多存活的心肌和较好的心功能,能耐受较大剂量的造影剂和较长时间的介入手术,从而获得较高的手术成功率。本研究表明,收缩压高的老年女性患者,PCI 开通冠状动脉 CTO 的成功率高,这与上述文献是一致的。

糖尿病患者冠状动脉 CTO 病变发生率高,且多伴有分支病变和广泛的冠状动脉负性重构,同时冠状动脉斑块也进展较快,增加 CTO 开通的难度,降低开通的成功率^[12]。糖尿病患者伴发肾功能不全的比例较高,肾功能不全患者所能耐受的造影剂总量小,不能耐受较长时间的造影操作,会降低手术的成功率。本研究也证实糖尿病或肾功能不全与老年冠状动脉 CTO 成功开通成负相关。

一个多中心的 CTO-PCI 注册研究表明,应用具有聚合物涂层锥形头端的导丝(如 Fielder XT)能够获得较高的通过率,同时不增加主要心血管不良事件和冠状动脉穿孔的风险^[13]。亦有研究发现,在 LAD-CTO 病变中起初应用具有锥形超软滑头端的 Fielder XT 导丝可提高手术的成功率^[14]。欧洲 CTO

表 2 2 组患者临床特征比较

Table 2 Comparison of clinical characteristics between two groups

Item	PCI success group (n = 250)	PCI failure group (n = 51)	P value
LVEF(%, $\bar{x} \pm s$)	59.4 ± 8.9	59.3 ± 10.3	0.947
LVEF > 50% [n(%)]	210(84.0)	43(84.3)	0.956
LVEDd(cm, $\bar{x} \pm s$)	48.0 ± 6.1	46.6 ± 6.2	0.151
SCr(μmol/L, $\bar{x} \pm s$)	67.4 ± 19.1	72.9 ± 23.8	0.072
CTR(%, $\bar{x} \pm s$)	54.2 ± 5.7	52.6 ± 6.6	0.081
NYHA classification[n(%)]			0.000
I	196(78.4)	27(52.9)	
II	45(18.0)	14(27.5)	
III	9(3.6)	10(19.6)	
Multivessel CAD[n(%)]	99(39.6)	18(35.3)	0.565
SLC[n(%)]	30(12.0)	9(17.6)	0.274
Tortuosity in occluded segment[n(%)]	8(3.2)	6(11.8)	0.008
Bridging collaterals[n(%)]	17(6.8)	9(17.6)	0.012
Blunt stump[n(%)]	9(3.6)	2(3.9)	0.793
Occlusion time(months, $\bar{x} \pm s$)	55.2 ± 74.7	72.5 ± 73.3	0.133
Occlusion time class[n(%)]			0.007
T < 12 months	85(34.0)	6(11.8)	
12 months ≤ T < 60 months	71(28.4)	19(37.3)	
T ≥ 60 months	94(37.6)	26(51.0)	
Retrop scale[n(%)]			0.127
0/1	85(34.0)	25(49.0)	
2	93(37.2)	15(29.4)	
3	72(28.8)	11(21.6)	
CTO target vessel[n(%)]			0.015
LM	0(0.0)	0(0.0)	
LAD	118(47.2)	14(27.5)	
LCX	24(9.6)	10(19.6)	
RCA	108(43.2)	27(52.9)	
Firstly using fielder XT wire[n(%)]	138(55.2)	18(35.3)	0.187
Aspirin[n(%)]	204(81.6)	40(78.4)	0.599
Clopidogrel[n(%)]	197(80.7)	46(91.7)	0.060

PCI: percutaneous coronary intervention; LVEF: left ventricular ejection fraction; LVEDd: left ventricular end diastolic diameter; SCr: serum creatinine; CTR: cardiothoracic ratio; NYHA: New York Heart Association; CTO: chronic total occlusion; CAD: coronary artery disease; SLC: severe lesion calcification; LAD: left anterior descending branch; LCX: left circumflex branch; LM: left main coronary artery; RCA: right coronary artery

表 3 影响 CTO 靶病变成功开通因素的二元 logistic 回归分析

Table 3 Binary logistic regression analysis of factors influencing successful opening of CTO target lesion

Risk factor	B	SE	Wald	Sig.	OR	95% CI
Female	1.724	0.624	7.626	0.006	5.608	1.650 – 19.069
SBP	0.033	0.015	5.080	0.024	1.034	1.004 – 1.064
Diabetes	-1.517	0.480	9.985	0.002	0.219	0.086 – 0.562
Renal insufficiency	-1.090	0.539	4.093	0.043	0.336	0.117 – 0.967
Previous AMI	1.976	0.974	4.117	0.042	7.213	1.070 – 48.645
NYHA classification	-1.436	0.394	13.264	0.000	0.238	0.110 – 0.515
LAD vessel	1.079	0.509	4.492	0.034	2.943	1.085 – 7.984
Firstly using Fielder XT wire	0.944	0.457	4.262	0.039	2.570	1.049 – 6.296
Tortuosity in occluded segment	-2.040	1.025	3.962	0.047	0.130	0.017 – 0.969
Bridging collaterals	-1.768	0.670	6.970	0.008	0.171	0.046 – 0.634
Constant	5.315	42.550	0.016	0.901	203.401	

CTO: chronic total occlusion; SBP: systolic blood pressure; AMI: acute myocardial infarction; NYHA: New York Heart Association; LAD: left anterior descending branch

俱乐部也推荐优先选用这类导丝^[1]。本研究发现处理老年冠状动脉 CTO 病变时首选 Fielder XT 导丝与首选其它导丝相比,开通老年患者冠状动脉 CTO

病变的成功率升高。考虑这是基于 CTO 病变内存在一些直径 100 ~ 200 μm 的微通道,这些微通道从闭塞近端延伸到闭塞段内小分支、血管壁、85% 闭塞

段长度或直接通向闭塞远端真腔内^[15],而闭塞段内存在微通道是 CTO 病变手术成功的预测因素^[16]。Fielder XT 头端最小直径 230 μm ,可用来寻找微孔道,并在不破坏闭塞近端结构的情况下沿微通道进入闭塞段真腔内。进入 CTO 闭塞段后 Fielder XT 沿导丝送微导管至闭塞段内,经微导管交换较硬的导丝,通过定向穿刺重回真腔。最终缩短闭塞远端撕裂的长度,提高老年患者冠状动脉 CTO 病变正向开通的成功率。

有研究显示,有 AMI 病史的患者 CTO 病变闭塞的平均时间较短,且闭塞时间与开通的成功率成负相关^[11],提示有 AMI 病史的老年冠状动脉 CTO 病变开通成功率高。这与本研究结果是相似的。另有研究证实,冠状动脉 CTO 病变闭塞段迂曲可增加手术难度^[17],自身桥侧支和病变迂曲亦是 CTO-PCI 失败的独立预测因素^[16]。本研究结果显示,扭曲 ($OR = 0.130, 95\% CI 0.017 \sim 0.969; P = 0.047$) 及桥状侧支 ($OR = 0.171, 95\% CI 0.046 \sim 0.634; P = 0.047$) 是降低正向导丝开通老年冠状动脉 CTO 病变成功率的不利因素,可能因为桥状侧支循环往往提示较长的闭塞时间,且正向操控导丝时容易进入桥状侧支,增加了正向导丝进入真腔的难度,最终降低了正向 PCI 技术开通的成功率。正向导丝技术开通迂曲的 CTO 闭塞段时,导丝也容易进入假腔内,因此同样降低了正向导丝技术开通老年冠状动脉 CTO 病变的成功率。

综上所述,既往有 AMI 病史、收缩压较高、靶病变为 LAD,且首先选用 Fielder XT 导丝的老年女性患者正向 PCI 技术开通冠状动脉 CTO 病变成功率增加,有糖尿病、既往肾功能不全、NYHA 分级较高、病变迂曲及桥状侧支的患者正向 PCI 技术开通 CTO 病变的成功率降低;因此,通过术前评估老年患者冠状动脉 CTO 病变特点,对预测冠状动脉 CTO 病变开通成功率具有重要参考价值。

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