

· 老年人周围血管疾病诊治专栏 ·

Fogarty 导管取栓联合高压球囊腔内成形术在老年血液透析患者自体动静脉内瘘狭窄伴血栓形成中的应用

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【摘要】目的 探讨 Fogarty 导管取栓联合高压球囊腔内成形术在老年血液透析患者自体动静脉内瘘狭窄伴血栓形成中的应用。**方法** 选择 2018 年 3 月至 2019 年 3 月于宜宾市第一人民医院杂交手术室同期行 Fogarty 导管取栓和高压球囊腔内成形术的老年血液透析患者 42 例为研究对象, 分析其治疗效果、并发症、通畅率及其影响因素。采用 SPSS 22.0 统计软件进行分析。采用 Breslow 检验对术后内瘘通畅时间影响因素进行单因素分析, Cox 风险回归分析对术后内瘘通畅率影响因素进行多因素分析。**结果** 手术成功率为 95.24% (40/42), 术后并发症发生率为 9.52% (4/42)。手术成功的患者术后 1 个月通畅率 97.5% (39/40), 3 个月通畅率 87.5% (35/40), 6 个月通畅率 72.5% (29/40), 12 个月通畅率 52.5% (21/40), 24 个月通畅率 22.5% (9/40)。单因素分析结果显示: 术后吸烟、血糖和血压控制差、残留狭窄、吻合口狭窄及穿刺点狭窄是影响老年患者术后内瘘通畅时间的独立危险因素 (均 $P < 0.05$)。多因素 Cox 分析结果显示: 术后吸烟、血糖和血压控制差、残留狭窄、吻合口狭窄及穿刺点狭窄是影响老年患者术后内瘘通畅率的独立危险因素 (均 $P < 0.05$)。**结论** Fogarty 导管取栓联合高压球囊腔内成形术治疗老年血液透析患者自体动静脉内瘘狭窄伴血栓形成手术成功率高, 术后短中期通畅率较高, 并发症较少。术后吸烟、血糖或血压控制差、残留狭窄、吻合口狭窄及穿刺点狭窄是影响老年患者术后内瘘通畅率的重要因素。

【关键词】 老年人; 老年血液透析; 自体动静脉内瘘狭窄伴血栓形成; Fogarty 导管; 高压球囊; 杂交手术

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Application of Fogarty catheter thrombectomy combined with high-pressure balloon intraluminal angioplasty in elderly hemodialysis patients with stenosis and thrombosis in autologous arteriovenous fistula

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【Abstract】Objective To explore the clinical application and clinical efficacy of Fogarty catheter thrombectomy combined with high-pressure balloon intraluminal angioplasty in elderly hemodialysis patients with stenosis and thrombosis in autologous arteriovenous fistula. **Methods** A total of 42 elderly hemodialysis patients who underwent thrombus removal with Fogarty catheter and high-pressure balloon angioplasty at the same time in the hybrid operating room of Yibin First People's Hospital from March 2018 to March 2019 were recruited in this study. Their clinical outcome, complications, patency rate and its influencing factors were analyzed. SPSS statistics 22.0 was used for data analysis. Breslow test was used to analyze the factors influencing the postoperative fistula time after hybrid surgery, and Cox risk regression analysis was employed to analyze the factors influencing the patency rate of postoperative fistula. **Results** The success rate of operation was 95.24% (40/42), and the postoperative complication rate was 9.52% (4/42). The patency rate of the patients with successful operation was 97.5% (39/40) at 1 month, 87.5% (35/40) at 3 months, 72.5% (29/40) at 6 months, 52.5% (21/40) at 12 months, and 22.5% (9/40) at 24 months. The results of univariate analysis showed that postoperative smoking, poor control on blood glucose and blood pressure, residual stenosis, anastomotic stenosis and puncture point stenosis were independent risk factors affecting the patency time of internal fistula in elderly patients (all $P < 0.05$). The results of multivariate Cox analysis showed that postoperative smoking, poor control on blood glucose and blood pressure, residual stenosis, anastomotic stenosis and puncture site stenosis were independent risk factors affecting the patency rate of postoperative internal fistula in elderly patients (all $P <$

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0.05)。**Conclusion** Fogarty catheter thrombectomy combined with high-pressure balloon endovascular angioplasty has a high success rate, high short- and mid-term postoperative patency rate and fewer postoperative complications in the treatment of stenosis and thrombosis in autologous arteriovenous fistula in the elderly hemodialysis patients. Postoperative smoking, poor control on blood glucose or pressure, residual stenosis, anastomotic stenosis, and puncture point stenosis are important factors that affect the patency of internal fistula after surgery in these patients.

【Key words】 aged; hemodialysis; stenosis in autologous arteriovenous fistula with thrombosis; Fogarty catheter; high-pressure balloon; hybrid surgery

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随着人们生活方式的改变及中国社会人口结构逐渐老龄化,高血压、糖尿病及慢性肾小球肾炎等患病人数逐年增加,导致慢性肾衰竭发病率不断上升。目前,国内需要血液透析的终末期肾病患者至少在 200 万左右,其中老年患者占 40% 以上,且还在不断增加^[1]。面对如此庞大的老年病患基数,维持良好的透析通路是患者血液透析的首要条件^[2]。而作为首选的自体动静脉内瘘(arteriovenous fistula, AVF)却随着年龄增加及病程延长越来越易出现狭窄及血栓形成等严重影响透析的并发症。本研究主要探讨 Fogarty 导管取栓联合高压球囊腔内成形术在老年血液透析患者 AVF 狭窄伴血栓形成中的应用,为维持良好的血液透析通路提供解决方案。

1 对象与方法

1.1 研究对象

选择 2018 年 3 月至 2019 年 3 月于宜宾市第一人民医院杂交手术室同期行 Fogarty 导管取栓和高压球囊腔内成形术的老年患者 42 例为研究对象,其中男性 23 例,女性 19 例。AVF 部位分别为左上肢 29 例,右上肢 13 例。患病原因分别为慢性肾小球肾炎 16 例,糖尿病肾病 13 例,高血压肾病 10 例,其他 3 例。纳入标准:(1)年龄 60~90 岁;(2)应用自体 AVF 长期规律行血液透析;(3)术前彩色多普勒超声检查确诊为 AVF 狭窄伴血栓形成。排除标准:(1)伴有严重心脑血管疾病;(2)伴有恶性肿瘤。本研究通过医院伦理审查,治疗前均获得患者及家属知情同意。

1.2 方法

具体手术方法如下。(1)常规消毒铺巾,1%利多卡因和 1%罗哌卡因混合液局部浸润麻醉,全身肝素化 0.5 mg/kg。(2)距吻合口 5~6 cm 平行于头静脉体表投影切开皮肤,分离皮下组织并游离头静脉。

头静脉近心端和远心端分别套扎硅胶止血带,横向切开头静脉,切口约 5 mm,向近心端送入 3.3 F 的 Fogarty 导管,X 光透视下 Fogarty 导管由超滑导丝的引导及支撑下进入头静脉,造影剂与 0.9%氯化钠溶液 1:1 混合后由 Fogarty 导管尾部侧孔注入,扩张固定球囊并回拉,直至血栓取出(图 1)。(3)根据直视下血管情况,选择高压球囊直径应等于邻近正常血管直径或>1 mm,一般选用直径 5 mm 或 6 mm 球囊。超滑导丝引导下将球囊准确置于狭窄处,外接压力泵注入造影剂与 0.9%氯化钠溶液 1:1 混合液,逐段增压扩张,均达到球囊爆破压(rated burst pressure, RBP),压力为 24 atm(1 atm=101.325 kPa),每次持续时间 60 s,反复 2~3 次后撤除导管(图 2)。(4)分别于头静脉近、远心端缓慢推注尿激酶 10 万 U,然后造影评估狭窄扩张情况及血栓清除情况。若仍存在血栓,则重复步骤(2)。详见图 1。(5)术后予以低分子肝素 100 U/kg 抗凝治疗。记录术中血管狭窄部位、狭窄程度、狭窄段数量、狭窄段长度及是否存在狭窄残留。

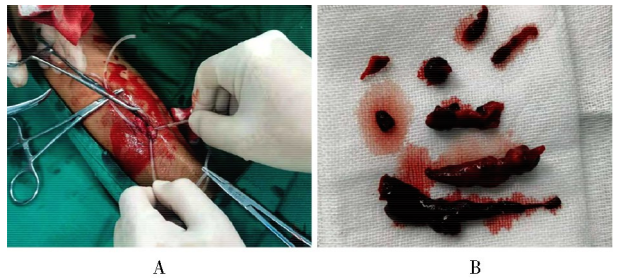


图 1 左上肢头静脉前臂段切开取栓

Figure 1 Thrombectomy of forearm segment of cephalic vein of left upper limb

A: vein incision, silicone tourniquet ligating and Fogarty catheter thrombectomy; B: removed vein thrombosis.

手术成功标准:松解硅胶止血带后,近心端有明显血液倒流,远心端有明显喷射样血流;再次造影近、远心端均未见明显血栓形成,狭窄残留<30%。

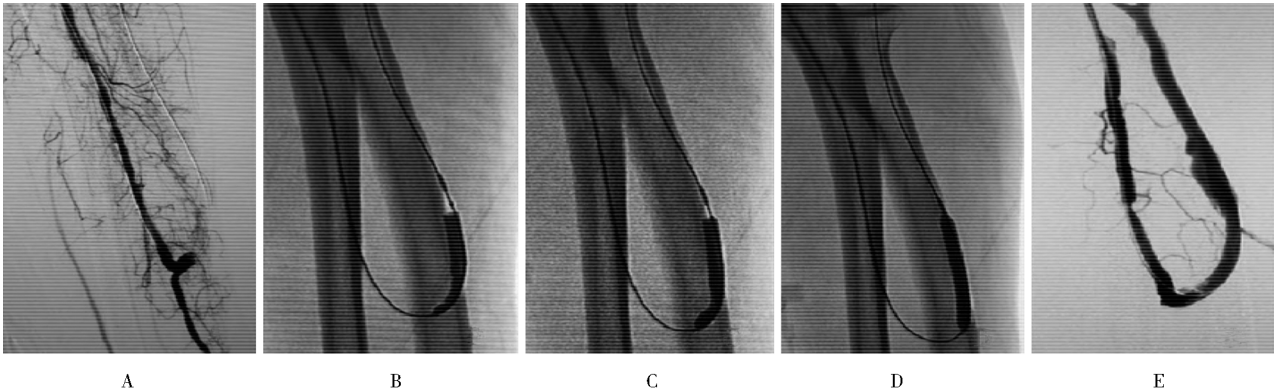


图 2 左上肢头静脉前臂段球囊扩张

Figure 2 Balloon dilation of forearm segment of cephalic vein of left upper limb

A: pre-dilation angiography; B: high-pressure balloon 12 atm expansion; C: 18 atm expansion of high-pressure balloon; D: 24 atm expansion of high-pressure balloon; E: angiography after dilation. 1 atm = 101.325 kPa.

1.3 随访方案

对所有患者均行 24 个月随访。记录患者一般资料,包括是否吸烟、是否存在血糖控制不良(空腹血糖<4.4 mmol/L 或>7 mmol/L,餐后血糖>10 mmol/L,糖化血红蛋白>7%)、血压控制不良[>150/90 mmHg 或<90/60 mmHg (1 mmHg = 0.133 kPa)]^[3-5],术后 1、3、6、12、24 个月内瘵仍保持通畅人数。AVF 通畅需满足以下全部条件:(1)局部狭窄率小于附近正常血管管径的 50%;(2)内瘵自然血流量>500 ml/min,且能满足血液透析所需血流量;(3)透析过程中未出现透析通路原因引起的静脉压升高报警^[6]。本研究终止事件为患者出现内瘵流量不能满足透析需要,须再次手术干预或患者死亡。

1.4 统计学处理

采用 SPSS 22.0 统计软件进行数据分析。计数资料用例数(百分率)表示,采用 χ^2 检验。非正态分布的计量资料用中位数(四分位数间距)[$M(Q_1, Q_3)$]表示,采用 Breslow 检验对术后内瘵通畅时间影响因素进行单因素分析,Cox 风险回归分析对术后内瘵通畅率影响因素进行多因素分析。 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 手术成功率

本研究所有患者均行 Fogarty 导管取栓和高压球囊腔内成形术手术,成功率为 95.24%(40/42)。吻合口严重钙化导丝无法通过,后改为重建 AVF 患者 1 例。狭窄段经反复扩张,仍有 50%狭窄残留,且松开硅

胶止血带后远心端未见明显喷射样血流患者 1 例。

2.2 术后并发症

术后并发症发生率为 9.52%(4/42)。其中伤口持续渗血,予以加压包扎后未见继续渗血患者 2 例;出现伤口红肿、渗液,分泌物培养提示金黄色葡萄球菌感染,对症抗感染后好转患者 1 例;术后内瘵震颤弱,彩色多普勒超声提示头静脉切口处附壁血栓形成,于头静脉切口远心端泵入尿激酶后,复查时血栓消失患者 1 例。

2.3 内瘵通畅率

手术成功的患者术后 1 个月通畅率 97.5%(39/40),3 个月通畅率 87.5%(35/40),6 个月通畅率 72.5%(29/40),12 个月通畅率 52.5%(21/40),24 个月通畅率 22.5%(9/40)。

2.4 术后内瘵通畅时间影响因素的单因素分析

单因素分析结果显示,性别、AVF 位置、浅静脉狭窄、狭窄程度、狭窄段长度及狭窄段数量对术后内瘵通畅时间影响不显著(均 $P>0.05$)。术后吸烟、血糖和血压控制差、残留狭窄、吻合口狭窄及穿刺点狭窄对术后内瘵通畅时间影响显著(均 $P<0.05$),是影响老年患者术后内瘵通畅时间的独立危险因素,详见表 1。

2.5 术后内瘵通畅率的多因素分析

以术后内瘵通畅时间为因变量,将单因素分析中有统计学差异的变量,纳入多因素 Cox 分析。结果显示,术后吸烟、血糖和血压控制差、残留狭窄、吻合口狭窄及穿刺点狭窄是影响老年患者术后内瘵通畅率独立危险因素(均 $P<0.05$;表 2)。

表 1 40 例手术成功的老年血液透析患者术后内瘘通畅时间影响因素的单因素分析

Table 1 Univariate analysis of factors influencing postoperative fistula patency time in 40 successful elderly hemodialysis patients [$M(Q_1, Q_3)$]				
Factor	<i>n</i>	Patency time	χ^2	<i>P</i> value
Gender			2.45	0.29
Male	23	7.42(4.92,11.95)		
Female	17	8.94(6.02,13.12)		
Smoking			18.42	0.00
Yes	15	3.46(1.87,5.65)		
No	25	9.36(6.72,14.13)		
Poor control on blood glucose			6.70	0.04
Yes	13	4.78(2.95,6.83)		
No	27	7.58(4.97,12.47)		
Poor control on blood pressure			11.28	0.00
Yes	16	3.42(2.03,4.74)		
No	24	10.23(7.52,14.67)		
Internal fistula location			1.17	0.56
Left arm	29	8.01(4.92,12.15)		
Right arm	11	8.89(3.63,13.46)		
Anastomotic stenosis			6.41	0.04
Yes	33	5.49(3.37,7.85)		
No	7	11.24(8.29,15.01)		
Superficial vein stenosis			3.45	0.18
Yes	21	6.22(4.96,8.07)		
No	19	8.12(6.96,12.07)		
Puncture point stenosis			7.96	0.02
Yes	28	7.67(5.91,9.35)		
No	12	14.42(9.62,18.33)		
Degree of stenosis			3.32	0.19
≥50%	37	5.11(4.02,6.42)		
<50%	3	7.16(4.64,10.32)		
Length of narrow section			1.09	0.58
≥3 cm	22	8.99(7.45,10.32)		
<3 cm	18	10.68(7.99,13.12)		
Number of narrow segments			0.89	0.64
≥2	29	7.79(4.98,10.62)		
1	11	9.09(6.38,11.77)		
Residual stenosis			23.78	0.00
Yes	8	3.03(1.92,4.97)		
No	32	13.62(10.22,16.05)		

表 2 术后内瘘通畅率的多因素分析

Table 2 Multi-factor analysis of postoperative internal fistula patency rate						
Factor	<i>B</i>	<i>SE</i>	<i>Wald</i> χ^2	<i>P</i> value	<i>HR</i>	95% <i>CI</i>
Smoking	0.69	0.24	7.76	0.02	2.11	1.27–6.35
Poor control on blood glucose	0.96	0.29	6.41	0.04	2.61	1.46–4.36
Poor control on blood pressure	1.27	0.40	10.43	0.00	3.78	1.87–4.42
Anastomotic stenosis	1.31	0.44	6.34	0.04	3.96	1.02–7.92
Puncture point stenosis	1.59	0.52	7.86	0.02	4.72	1.56–6.89
Residual stenosis	2.01	0.67	23.09	0.00	5.99	3.32–14.70

All factors were assigned as smoking (yes = 1, no = 0), poor control on blood glucose (yes = 1, no = 0), poor control on blood pressure (yes = 1, no = 0), anastomotic stenosis (yes = 1, no = 0), puncture site stenosis (yes = 1, no = 0), residual stenosis (yes = 1, no = 0).

3 讨论

终末期肾病如今已成为我国一个不可忽视的公共卫生问题,近年来终末期肾病的患病率不断上升。血液透析是老年终末期肾病患者肾脏替代治疗的主要方式,而 AVF 又是血液透析患者的首选血管通路,日益受到临床医师的重视^[7-9]。维持一个功能良好的 AVF 是延长透析老年患者生存时间及保证生存质量的重要措施。影响 AVF 正常功能的因素较多,主要包括吻合口处的静脉内膜显著增生、肥厚,继发血栓形成及血栓直接形成^[10]。其中动静脉通路狭窄是内瘘功能不良最常见原因之一,发生机制尚未完全阐明,但一旦伴发血栓形成,则会直接导致 AVF 失功,严重影响患者血液透析质量,甚至危及患者生命^[11]。老年终末期肾病患者由于糖尿病和高血压等慢性疾病患病率高,合并较多周围血管病变,更易发生诸多如内瘘狭窄及血栓形成等并发症^[12]。

运用高压球囊对内瘘狭窄行经皮腔内血管成形术是目前研究热点,国内外大量研究证实,应用高压球囊的手术成功率及术后 6 个月内瘘开放率比普通球囊更高^[13,14];且由于经济因素,更倾向于直接应用高压球囊,而不是普通球囊失败后再使用,这样可以从较低的压力开始逐步扩张,能最大限度地提高技术成功率,是避免加重血管内膜损伤的重要手段^[11]。然而,高压球囊的应用也存在一定的局限性,单纯的内瘘狭窄疗效良好,但合并血栓形成的内瘘狭窄却难以取得理想效果。当单一开放手术或腔内介入手术难以彻底解决问题时,就需要在开放手术的同时借助导管技术,在实时影像学指引下实施血管腔内治疗,即杂交手术^[15]。对此,本研究通过联合应用 Fogarty 导管取出内瘘血栓,减少血管内容物,为延长内瘘通畅时间提供必要条件^[6]。手术采取横向切开并缝合血管的方法,也能最大程度减少切开部位人为造成狭窄的并发症。本研究术后并发生症少且轻,予以对症处理后均好转,未影响正常血液透析的进行。结果显示,同期应用上述两种手术方案,能很好地解决内瘘狭窄伴血栓形成这一难题。

同时,反复多次对病变血管进行取栓、扩张等操作,术后往往伴随较高的再狭窄率^[16]。本研究结果显示,老年患者术后吸烟、血糖、血压控制差及内瘘功能不良发生率明显高于术后未吸烟、血糖及血压控制良好患者。存在吻合口狭窄、穿刺点狭窄及残留狭窄的老年病患内瘘功能不良发生率明显高于无吻合口狭窄、穿刺点狭窄及残留狭窄的患者。但本研究结果显示残留狭窄长度与内

瘘通畅率并无统计学相关性,与罗泽恩等^[11]研究结果不同。分析原因可能是由于老年患者血管弹性回缩力减弱,狭窄段经高压球囊扩张后难以形成血管整体收缩所致。

综上,本研究结果显示 Fogarty 导管取栓联合高压球囊腔内成形术的杂交手术,在治疗老年血液透析患者 AVF 狭窄伴血栓形成中技术成功率及术后短中期通畅率均较高,术后并发症少。同时,建议老年终末期肾病患者应严格戒烟,积极控制血糖和血压,尽可能为内瘘通路维持一个良好的内在环境。

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