

doi: 10.13241/j.cnki.pmb.2017.14.016

彩色多普勒超声在血液透析动静脉内瘘功能评估及病变检测中的应用探究

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摘要 目的:探讨彩色多普勒超声在血液透析动静脉内瘘功能评估及病变检测中的应用价值。**方法:**选取2013年3月至2016年3月于我院接受血液透析的终末期肾病患者62例作为研究对象,采用二维超声观察动静脉内瘘的一般情况,采用彩色多普勒观察血流方向、速度以及充盈情况,对检测结果进行比较。**结果:**自体动静脉内瘘成形术后桡动脉管径(RAD)、桡动脉血流量(RVF)、头静脉管径(CVD)均较术前有所提高,各项指标随时间延长而逐渐增高,差异有统计学意义($P<0.05$)。62例血液透析患者中,共有41例(66.13%)患者动静脉内瘘通畅,21例(33.87%)患者出现动静脉内瘘并发症,其中血栓形成9例(14.52%)、动静脉瘘狭窄7例(11.29%)以及静脉瘤状扩张5例(4.84%)。血栓形成组头静脉血管内径(D)、吻合口D、最大峰值流速(PSV)及血流阻力指数(RI)、桡动脉D、PSV及RI均较正常组有显著差异。血栓形成、动静脉瘘狭窄患者上述参数及血流量与正常组比较有显著差异($P<0.05$)。**结论:**彩色多普勒超声可有效监测血液透析患者动静脉内瘘病变发生情况,对其结构功能进行直接观察的同时还可明确诊断动静脉内瘘并发症。

关键词:彩色多普勒超声;血液透析;动静脉瘘

中图分类号:R543;R459.5;R445.1 **文献标识码:**A **文章编号:**1673-6273(2017)14-2671-03

Application Value of CDFI in the Evaluation and Diseases Detection of Arteriovenous Fistula

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ABSTRACT Objective: To explore the application value of colored doppler ultrasound in the evaluation and diseases detection of arteriovenous fistula. **Methods:** 62 ESRD patients underwent hemodialysis in our hospital from Mar.2013 to Mar.2016 were selected and detected by colored doppler ultrasound. Two-dimensional ultrasound was using for general detection of arteriovenous fistula, CDFI was using for detection of blood flow, velocity and filling. Then the indexes of detection were compared. **Results:** RAD, RVF and CVD after arteriovenostomy were getting higher than before and improved as time prolonged ($P<0.05$). There were 41 cases (66.13%) with fluent flow of arteriovenous fistula, 21 cases (33.87%) with complications, among them were 9 cases (14.52%) DVT, 7 cases (11.26%) stenosis and 5 cases (4.84%) expansion. The diameter of cephalic vein, diameter, PSV and RI of anastomosis and radial artery of thrombosis group were all had differences with normal group. The indexes above and blood flow of patients with complications had great differences compared to normal group ($P<0.05$). **Conclusion:** Using color doppler ultrasound could surveillance the diseases of arteriovenous fistula of patients underwent hemodialysis, which could directly observe the structure and function.

Key words: Colored doppler ultrasound; Hemodialysis; Arteriovenous fistula

Chinese Library Classification(CLC): R543; R459.5; R445.1 **Document code:** A

Article ID: 1673-6273(2017)14-2671-03

前言

血液透析是终末期肾脏疾病患者常见的治疗手段,自体动静脉内瘘是一种将患者上臂或前臂动、静脉直接采用外科手术进行吻合的操作方式,通过动静脉吻合使血流量达到血液透析所要求是终末期肾脏疾病血液透析的首选血管通路^[1,2]。自体动静脉内瘘是否通畅是血液透析能否顺利进行的重要依据,因

此临床常采用影像学手段对其形态、功能等一般情况以及并发症发生情况进行考察与评价^[3]。以往临床工作中,血管造影是自体动静脉瘘检测与评估的重要方法,具有较高的准确性,然而血管造影为有创性检查,限制了其在患者常规检查及随访当中的应用^[4,5]。彩色多普勒超声是一种无创性检查,且能从一般形态及血流动力学等方面进行综合考察,在多种疾病的检测中发挥了重要作用^[6-8]。我院近年来使用彩色多普勒超声评价血液透析动静脉内瘘情况,现总结如下。

1 资料与方法

1.1 一般资料

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(收稿日期:2016-10-06 接受日期:2016-10-30)

收取 2013 年 3 月至 2016 年 3 月于我院接受血液透析的终末期肾病患者 62 例作为研究对象,按照以下标准进行纳入与排除:① 所有患者均于我院接受血液透析治疗,且均行自体动静脉吻合内瘘,行头静脉与桡动脉侧端吻合;② 均接受彩色多普勒超声检查。对 62 例患者临床资料进行汇总,共包含男性患者 41 例,女性患者 21 例,年龄 45~79 岁,平均年龄(55.7±8.2)岁。按照原发疾病不同可分为糖尿病肾病 23 例、肾小球疾病 21 例、高血压肾病 15 例、痛风 3 例。

1.2 检查方法

对 62 例患者采用 PHILIPS HD15 彩色多普勒超声诊断仪进行检查,使用高频探头 L17-5,探头频率 5~17 MHz。扫描时嘱患者取仰卧位,充分暴露上肢,平放外展与躯干呈 60°,适当垫高腕部。首先使用二维超声依次扫查供应动脉(桡动脉)、吻合口以及引流静脉(头静脉)三者的位置,明确三者间关系。之后采用彩色多普勒对血流情况及血管充盈情况进行检测。检测过程中应当注意使探头与皮肤表面尽量保持垂直,以免加压血管表面,增大测量误差。同个部位重复进行 3 次测量并计算平均值。

1.3 判断标准

在自体动静脉内瘘成熟程度的评估方面,主要记录桡动脉

管径(RAD)、桡动脉血流量(RVF)、头静脉管径(CVD)以及头静脉血流量(CVF)。自体动静脉内瘘成熟参照文献报道标准,即超声未见明显并发症,CVD 增宽并且其内血流量超过 400 mL/min,并满足开始使用时透析机泵控血流量可达到 200 mL/min;在动静脉内瘘并发症的评估方面,主要记录血管内径(D)、最大峰值流速(PSV)以及血流阻力指数(RI)。根据文献报道[9],以血管内径对内瘘狭窄情况进行评估:吻合口内径<2.5 mm 为吻合口狭窄,静脉端内径<3.0 mm 为静脉端狭窄,且与邻近正常血管比较内径减少 50%,PSV>4.0 m/s。

1.4 统计学方法

本研究采用 SPSS (VERSION 18.0) 统计分析软件处理数据,计量数据均以均数±标准差形式表示,多组间采用方差分析进行比较,两组间采用 t 检验进行比较,以 P<0.05 为差异具有统计学意义。

2 结果

2.1 自体动静脉内瘘成熟进程评估

对自体动静脉内瘘成形术后患者内瘘成熟进程评估,结果显示:术后 RAD、RVF 以及 CVD 均较术前有所提高,各项指标随时间延长而逐渐增高,差异有统计学意义(P<0.05)。见表 1。

表 1 自体动静脉内瘘成熟进程评估($\bar{x}\pm s$)
Table 1 Evaluation of maturation of arteriovenous fistula($\bar{x}\pm s$)

Time	RAD(cm)	RVF(mL/min)	CVD(cm)	CVF(mL/min)
Before surgery	0.19± 0.03	23.65± 12.71	0.21± 0.02	-
2 weeks after surgery	0.28± 0.05	364.89± 120.33	0.36± 0.04	584.21± 223.92
4 weeks after surgery	0.32± 0.07	563.92± 185.41	0.42± 0.05	827.65± 320.88
6 weeks after surgery	0.35± 0.09	688.01± 250.32	0.49± 0.07	982.63± 504.16
P	<0.05	<0.05	<0.05	<0.05

2.2 动静脉内瘘并发症的发生情况

本研究观察的 62 例血液透析患者中,共有 41 例(66.13%)患者动静脉内瘘通畅,超声表现为桡动脉及头静脉增粗、流速增快,可探及动脉样血流及瘘口处高速湍流频谱。其他 21 例(33.87%)患者出现动静脉内瘘并发症,其中血栓形成 9 例(14.52%)、动静脉瘘狭窄 7 例(11.29%)以及静脉瘤状扩张 5 例(4.84%)。血栓形成超声表现为头静脉增粗,探头加压管腔可不出现明显变形,彩色多普勒可见局部无血流现象;动静脉瘘狭窄超声表现为瘘口或血管内径明显缩小,探头加压管腔可不出现明显变形,彩色多普勒显示血流充盈较差;静脉瘤状扩张超声表现为头静脉内径增宽、管壁增厚,彩色多普勒可见 PSV 明显降低。

2.3 动静脉内瘘并发症彩色多普勒参数比较

对动静脉内瘘并发症的彩色多普勒参数进行分析比较,结果显示:血栓形成组头静脉 D、吻合口 D、PSV 及 RI、桡动脉 D、PSV 及 RI 均较正常组有显著差异;动静脉狭窄组头静脉、吻合口及桡动脉各参数均较正常组有显著差异;静脉瘤状扩张组头静脉 D、PSV 以及桡动脉 PSV 与正常组比较差异显著(P<0.

05)。见表 2。

2.4 动静脉内瘘并发症血流量比较

本研究观察的 62 例患者动静脉内瘘血流量参数 352~2135 mL/min。41 例动静脉内瘘通畅患者平均血流量(1254.68±355.21)mL/min,9 例血栓形成患者平均血流量(653.44±129.87)mL/min,7 例动静脉瘘狭窄患者平均血流量(459.21±138.51)mL/min,5 例静脉瘤状扩张患者平均血流量(1160.45±268.94)mL/min。血栓形成、动静脉瘘狭窄患者血流量与正常组比较有显著差异(P<0.05)。

3 讨论

作为终末期肾病的主要治疗手段,血液透析前需要提前建立血管通路。2001 年,美国肾脏病基金会报道的《肾脏疾病质量控制临床实践指南》中明确提出^[10]终末期肾病患者应使用自身动静脉建立的内瘘进行血液透析,此方法对于减少并发症、提高患者生活质量及改善预后具有十分重要的意义。自体动静脉内瘘的通畅及良好的功能状况对血液透析的顺利开展具有十分重要的意义^[11]。定期术后评估可及早发现动静脉内瘘相关

表 2 动静脉内瘘并发症彩色多普勒参数比较($\bar{x} \pm s$)Table 2 Comparison of indexes of CDFI of patients with arteriovenous fistula complications($\bar{x} \pm s$)

	Indexes	Fluent flow	DVT	Stenosis	Expansion
Cephalic veins	D(mm)	5.5± 0.7	4.6± 0.6 ^a	4.1± 0.6 ^a	6.9± 1.0 ^a
	PSV(cm/s)	175.42± 68.44	172.18± 53.94	192.30± 89.32 ^a	118.46± 35.71 ^a
Anastomosis	D(mm)	3.8± 0.7	3.2± 0.5 ^a	2.4± 0.2 ^a	3.4± 0.5
	PSV(cm/s)	429.11± 85.47	338.70± 59.14 ^a	329.43± 56.29 ^a	410.08± 76.38
	RI	0.42± 0.10	0.59± 0.21 ^a	0.56± 0.18 ^a	0.41± 0.11
Radial artery	D(mm)	5.2± 0.9	4.2± 0.3 ^a	3.8± 0.2 ^a	5.2± 1.0
	PSV(cm/s)	185.36± 65.36	150.18± 42.07 ^a	112.30± 25.64 ^a	148.32± 39.87 ^a
	RI	0.36± 0.05	0.52± 0.10 ^a	0.52± 0.08 ^a	0.35± 0.07

Note: Compared to patients with fluent flow, ^aP<0.05.

并发症,有助于临床早期进行干预或治疗^[12,13]。尽管血管造影在动静脉内瘘评估中有一定价值,但该方法为有创检测,不能频繁使用,因此不适用于患者术后定期评估^[14-16]。随着影像学技术的发展,彩色多普勒超声造影在内瘘血管检测方面发挥出较好的作用,与血管造影相比,该方法无创、安全,与传统超声相比,该方法对血管管径、流速及充盈情况均可进行定量观察,有助于临床检测和分析^[17,18]。

本研究使用彩色多普勒超声评价血液透析患者动静脉内瘘情况,首先是从自体动静脉内瘘成熟进程方面进行。有研究表明自体动静脉内瘘建立到内瘘成熟一般需要至少 4 周时间,以可为血液透析提供充足的血流量作为内瘘成熟的判断标志。本研究结果显示从术前到术后 6 w,彩色多普勒超声观察到各项参数一直处于动态变化之中,这种动态变化与自体动静脉内瘘的成熟及功能完善具有相关性,故可认为彩色多普勒超声对于自体动静脉内瘘结构功能改变具有良好的监测意义。

本研究结果显示共有 41 例患者动静脉内瘘通畅,21 例患者出现动静脉内瘘并发症,其中血栓形成 9 例、动静脉瘘狭窄 7 例、静脉瘤状扩张 5 例(4.84%)。这些并发症超声表现及参数统计各异,将其进行综合分析考虑对动静脉内瘘情况评估及并发症的早期发现意义重大。现将本研究结果进行汇总:① 与动静脉内瘘通畅(正常组)患者相较,血栓形成患者头静脉内径、吻合口内径及桡动脉内径均显著降低,吻合口流速及桡动脉流速均明显下降、血流阻力增大,该结果与血栓形成的病理特征相符合;② 动静脉狭窄患者彩色多普勒参数与血栓形成患者相似,这是由于部分动静脉狭窄患者是由血栓形成长期发展所致。二者区别之处在于动静脉狭窄患者头静脉、吻合口或桡动脉内径更窄,桡动脉峰值流速更低;③ 静脉瘤状扩张与正常组患者相较头静脉内径明显增宽,PSV 明显减缓。

内瘘血流量是评估内瘘功能的重要指标^[19]。Teodorescu 等研究认为^[20]内瘘血流量往往具有较大的个体差异,但其正常范围多居 800~1500 mL/min。本研究中,血栓形成、动静脉瘘狭窄患者血流量分别为 (653.44±129.87)mL/min 及 (459.21±138.51)mL/min,与正常组比较有显著差异,提示对于血流量<800 mL/min 的患者应当引起注意,对并发症发生情况进行早期排查,一旦发现并发症则可及时进行干预。

综上所述,彩色多普勒超声可有效监测血液透析患者动静脉内瘘病变发生情况,对其结构功能进行直接观察的同时还可明确诊断动静脉内瘘并发症,具有重要的临床应用价值。

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