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对比增强经颅多谱勒超声对心房右向左分流患者的诊断价值的分析 *

时美欣 陈洪苹 李国忠 段淑荣 刚宝芝 李国霖△

(哈尔滨医科大学附属第一医院神经内科 黑龙江 哈尔滨 150001)

摘要 目的:比较对比增强经颅多普勒超声与经胸壁超声心动图、经食管超声心动图对心房右→左分流患者的鉴别诊断价值。**方法:**回顾性分析 2014 年 9 月至 2018 年 11 月哈尔滨医科大学附属第一医院经手术证实的 41 例心房右→左分流患者对比增强经颅多普勒超声及经胸壁超声心动图的检查所见及诊断结果,并回顾性分析其中 29 例患者对比增强经颅多普勒超声、经胸壁超声心动图及经食管超声心动图的检查所见及诊断结果。**结果:**在经手术证实的 41 例心房右→左分流患者中,对比增强经颅多普勒超声检查阳性结果 41 例,阴性结果 0 例,诊断准确性为 100%;经胸壁超声心动图检查阳性结果 20 例,阴性结果 21 例,诊断准确性为 48.8%。其中,同时进行对比增强经颅多普勒超声、经胸壁超声心动图及经食管超声心动图检查的 29 例患者中,经胸壁超声心动图阳性结果 12 例,阴性结果 17 例,诊断准确性为 41.4%;经食管超声心动图检查阳性结果 24 例,阴性结果 5 例,诊断准确性为 82.8%。**结论:**对比增强经颅多普勒超声可提高心房右→左分流的诊断准确率,其与经胸壁超声心动图及经食管超声心动图结合应用可提高心房右→左分流的鉴别诊断能力。

关键词:卵圆孔未闭;右→左分流;对比增强经颅多普勒超声与经胸壁超声心动图;经胸壁超声心动图;经食管超声心动图

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Diagnostic value of Contrast Enhanced Transcranial Doppler for the Atrial Right-to-left Shunt Patients*

SHI Mei-xin, CHEN Hong-ping, LI Guo-zhong, DUAN Shu-rong, GANG Bao-zhi, LI Guo-lin△

(Department of Neurology Department, the First Affiliated Hospital of Harbin Medical University, Harbin, Heilongjiang, 150001, China)

ABSTRACT Objective: To compare the clinical value of contrast enhanced transcranial Dopple ultrasound, transthoracic echocardiography and transesophageal echocardiography in diagnosing atrial right to left shunt patients. **Methods:** The clinical manifestations of 41 right to left shunt patients which were confirmed by postoperative pathology were retrospectively analyzed in the First Affiliated Hospital of Harbin Medical University from September 2014 to November 2018. The results were compared between the contrast enhanced transcranial Dopple ultrasound and transthoracic echocardiography. 29 of them were even retrospectively analyzed and compared the results between the contrast enhanced transcranial Dopple ultrasound and transesophageal echocardiography. **Results:** To 41 right to left shunt patients who were confirmed by postoperative pathology, contrast enhanced transcranial doppler ultrasound showed positive results in 41 cases and negative results in 0 cases. The accuracy of diagnosis of atrial right to left shunt was 100% for contrast enhanced transcranial Dopple ultrasound. But for transthoracic echocardiography, twenty cases had positive results and 21 cases had negative results. The accuracy of diagnosis of atrial right to left shunt was 48.8% for transthoracic echocardiography. Contrast enhanced transcranial doppler echocardiography, transthoracic echocardiography and transesophageal echocardiography were performed in 29 patients. Transthoracic echocardiography had positive results in 12 cases and negative results in 17 cases, with the diagnostic accuracy of 41.4%. The results of transesophageal echocardiography were positive in 24 cases and negative in 5 cases, with the diagnostic accuracy of 82.8%. The contrast enhanced transcranial doppler ultrasound with the diagnostic accuracy of 100%. **Conclusion:** Contrast enhanced transcranial doppler ultrasound can improve the diagnostic accuracy of atrial right to left shunt, and its combined application with transthoracic echocardiography and transesophageal echocardiography can improve the differential diagnosis ability of atrial right to left shunt.

Key words: Patent foramen ovale; Right-to-left shunt; Contrast enhanced transcranial Doppler; Transthoracic echocardiography; Transesophageal echocardiography

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作者简介:时美欣(1987-),女,硕士,住院医师,研究方向:影像医学与核医学,电话:15846388340,E-mail: 116926429@qq.com

△ 通讯作者:李国霖,男,硕士,主任医师,研究方向:颅脑及颈部血管超声

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前言

心房右→左分流(right-to-left shunt,RLS)是指心房及心室间或者体、肺循环间存在异常通道,当右心压力升高时,增大的压力高于左心,血液经潜在的异常通道产生右→左分流[1],作为潜在的病因已经进入临床医生的视野中。对 RLS 进行定性诊断不仅能为临床提供正确的诊断信息,同时也能为临床进一步治疗提供帮助及依据。目前,诊断 RLS 的检查方法主要为对比增强经颅多普勒超声 (contrast enhanced transcranial Doppler, c-TCD)、经胸壁超声心动图 (transthoracic echocardiography, TTE)和经食管超声心动图(transesophageal echocardiography, TEE),各有优缺点。本研究拟比较 c-TCD、TTE 和 TEE 对 RLS 的鉴别诊断价值,现报道如下。

1 资料与方法

1.1 研究对象

回顾性分析 2014 年 9 月至 2018 年 11 月哈尔滨医科大学附属第一医院经手术证实的 41 例 RLS 患者。所有患者于手术前均进行了 c-TCD、TTE 两项检查,其中 29 例患者进行了 TEE 检查。41 例患者中,男性 22 例,女性 19 例,年龄 10~67 岁,平均年龄(43± 16)岁,超声所见病灶长径约 1~32 mm。

1.2 仪器与方法

采用德国 PIONEER.TC8080 型经颅多普勒超声仪及多通道 TCD 技术,同时监测多个不同深度及多条血管通路。应用经颅多普勒超声仪所配备的频率为 2 MHZ 探头, 同时调整取样容积和监测深度。采用手振生理盐水作为造影剂,进行肘静脉微泡注射。使用前准备 3 支 20 mL 注射器、一袋 100 mL 无菌生理盐水和一个三相开关, 将一号注射器抽取 9 mL 生理盐水和无菌生理盐水袋中的 1 mL 空气,二号注射器为空注射器,三号注射器抽取 5 mL 生理盐水备用冲管。操作开始时,首先用三相开关连接一、二号注射器及肘前静脉留置针,调节三相开关,使得一号注射器抽取几滴患者血液,再次调节三相开关使得两支注射器相通,利用两支注射器快速往返运动以充分振荡注射器内的盐水、空气和血液,制成三者的混悬液即为微泡造影剂,后经肘前静脉快速注入造影剂,继而快速推注三号注射器内的 5 mL 生理盐水冲管。

患者检查前需了解操作步骤, 多次练习 Valsalva 动作,以确保整个检查过程能够顺利进行。患者取仰卧位,探头放于颞窗,造影前首先应用多普勒超声仪探查 MCA 以调节探头处于最佳位置,并记录 MCA 血流信号情况。随后转换进入多通道技术,嘱患者平缓呼吸,第一次注入造影剂并记录图像,每次操作需观察 3 min 以上;后第二次注入造影剂,注入后 10 s 嘱患者行 Valsalva 动作并记录图像。通常每个患者推注盐水 3 次,第 1 次是在患者平静呼吸下完成,随后监测均增加 Valsalva 动作。所采集图像均记录在超声仪硬盘内。

1.3 记录结果

空气微泡栓子信号判断[2]:① 时程短,约小于 300 ms;② 信号强度高:栓子信号强度高于背景信号 3dB;③ 频谱方向呈单向;④ 伴有尖锐的哨音[2]。

注射盐水造影剂 20 s 内,监测到一过性高强度信号即定义为 RLS 阳性。造影剂注射间隔 2 min 以上。患者的分流计数为微泡栓子信号最多数量。如果静息状态时未监测到栓子信号,Valsalva 动作 2 次后,其中一次监测到栓子信号,而另一次未监测到栓子信号,则记为阴性[2]。

根据分流计数,将 RLS 分为 4 级:无分流,即阴性;1～10 个信号记为小量分流;中 10～25 个信号记为量分流;大于 25 个信号记为大量分流,即雨帘型,表现为难以区分出单个微泡信号。RLS 分为两种类型,根据在 Valsalva 动作后或静息状态下出现栓子分为潜在型和固有型[2,3]。

1.4 统计学分析

以手术病理结果作为金标准,分别计算 41 例患者 c-TCD、TTE 诊断 RLS 的准确性; 并计算其中 29 例患者 c-TCD、TEE 诊断 RLS 的准确性。

2 结果

2.1 经手术证实的 41 例 RLS 患者 c-TCD 与 TTE 检查表现

术前 c-TCD 检查结果均为阳性,包括 19 例固有型大量、1 例固有型中量、10 例潜在型大量、3 例潜在型中量、3 例固有型少量 / 潜在型大量、1 例固有型少量 / 潜在型中量、4 例固有型中量 / 潜在型大量。

术前 TTE 检查结果包括 20 例阳性结果、21 例阴性结果;在 20 例阳性结果中,TTE 检查所见为房间隔卵圆窝处探及回声失落区,心房见左→右血流信号,病灶长径约 1~31 mm。

2.2 经手术证实的 29 例 RLS 患者 c-TCD、TTE、TEE 检查表现

术前 c-TCD 检查结果均为阳性,包括 15 例固有型大量、1 例固有型中量、5 例潜在型大量、2 例潜在型中量、1 例固有型少量 / 潜在型大量、1 例固有型少量 / 潜在型中量、4 例固有型中量 / 潜在型大量。

术前 TTE 检查结果包括 12 例阳性结果、17 例阴性结果;在 12 例阳性结果中,TTE 检查所见为房间隔卵圆窝处探及回声失落区,心房见左→右血流信号,病灶长径约 1~31 mm。

术前 TEE 检查结果包括 24 例阳性结果、5 例阴性结果;在 24 例阳性结果中,TEE 检查所见为房间隔卵圆窝处探及回声失落区, 心房见左→右血流信号, 病灶长径约丝状血流信号 1~32 mm。

表 1 c-TCD 与 TTE 在右→左分流中诊断价值比较。

Table 1 The diagnostic value of c-TCD and TTE in right-to-left shunt

	Positive	Negative	Accuracy rate
c-TCD	41	0	100%
TTE	20	21	48.8%

Note: c-TCD, Contrast enhanced transcranial Doppler; TTE, Transthoracic echocardiography.

2.3 41 例患者的 c-TCD 与 TTE 检查对 RLS 的诊断价值比较

经手术证实的 41 例 RLS 患者的 c-TCD 及 TTE 检查诊断准确性分别为 100 %、48.8 %(表 1)。

2.4 29 例患者的 c-TCD 与 TTE、TEE 检查对 RLS 的诊断价值比较

经手术证实的 29 例 RLS 患者的 c-TCD、TTE、TEE 检查诊断准确性分别为 100 %、41.4 %、82.8 %(表 2)。

表 2 c-TCD, TTE 与 TEE 在右→左分流中诊断价值比较

Table 2 The diagnostic value of c-TCD, TTE and TEE in right-to-left shunt

	Positive	Negative	Accuracy rate
c-TCD	29	0	100%
TTE	12	17	41.4%
TEE	24	5	82.8%

Note: c-TCD, Contrast enhanced transcranial Doppler; TTE, Transthoracic echocardiography; TEE, Transesophageal echocardiography.

3 讨论

RLS 的存在可导致多种疾病,如晕厥[4,5]、隐源性卒中[6,7]、偏头痛[8,9]及慢性换气过度综合征[10]等,但其发病机制尚有争议[3,11,12]。根据静息时是否发病可将 RLS 分为潜在型和固有型,按照 RLS 的发生部位又将分流分为心内和心外型,前者包括室间隔缺损[13]、房间隔缺损[14]、卵圆孔未闭(patent foramen ovale,PFO)[15]等,后者包括动脉导管未闭[16]、肺动静脉瘘等[17]。在这些疾病中,以 PFO 最常见,占比达 95 %,是心脏右→左分流的主要原因之一。尸检和流行病学研究结果表明 PFO 在人群中的发病率为 10 %到 29 %[18],而研究发现越来越多的疾病与 PFO 相关[19,20]。

目前,诊断 PFO-RLS 的常用方法包括 c -TCD、TTE、TEE,三种检查方式,各有优缺点。TTE 为临床上最为常见的 PFO-RLS 术前诊断及术后复查的检查手段,具备便宜、安全、无创的特点,但其敏感性较低,存在一定误差,适合大范围筛查及疾病的初步诊断[21]。一直以来,TEE 被认为是诊断 PFO-RLS 的金标准,但其属于侵入性检查,患者的依从性及耐受性较差,且因检查需要而进行的镇定及插管操作,使 Valsalva 动作较难完成。而经大脑中动脉进行的 c-TCD 具有相似的高敏感性(70-100 %),评价方式客观,不易受人为因素干扰,且具有无创、安全及临床可操作性强等优势,患者更容易接受,适宜于大规模应用[22-24]。c-TCD 还可以通过微栓塞信号分级评分对右→左分流严重程度进行分级[25]。通过大量实验证实,联合检查对提高 PFO-RLS 诊断的特异性和敏感性有较大价值[26]。

本研究中,经手术证实的 41 例同时进行 c -TCD 及 TTE 的 PFO-RLS 患者的诊断准确率分别为 100 %、48.8 %,29 例同时进行 c-TCD、TTE、TEE 的 PFO-RLS 患者的诊断准确率分别为 100 %、41.4 %、82.8 %。结果表明 c-TCD 对 PFO-RLS 的诊断敏感性更高,与既往国内外研究结果相一致,对于心脏超声无法判断的 PFO-RLS 患者,c-TCD 是一个更适合的进一步检查方式。

在 41 例患者 c-TCD 检查中,36 例表现为大量分流,所占比例为 87.8 %,同时在 29 例进行了 TEE 检查的患者中,c-TCD 检查可见 25 例表现为大量分流,所占比例为 86.2 %,可见被 c-TCD 诊断为大量分流时,临床上进行手术的可能性较高,且均证实为 PFO-RLS 阳性,而有些患者在 c-TCD 诊断为阳性小量或中量时,临床症状轻微,并未进行手术治疗,而是采取内科干预来缓解症状,效果明显,这提示 c-TCD 检查的流量分级有利于临床医生判断患者病情,选择最佳治疗方案。在本研究纳入的 41 例患者中,静息状态下 c-TCD 检测出 PFO-RLS 阳性患者为 28 例,所占比例为 68.3 %,而进行 Valsalva 动作后检出率为 100 %,提示进行 Valsalva 动作可以增加 c-TCD 对于 PFO-RLS 的检测率,提高检查的敏感性。

综上所述,c-TCD 和 c -TTE 均是在安全无创且高灵敏度的基础上又可以重复操作、也可在床边操作的检查手段,二者联合应用可以克服 TEE 检查的缺点,提高对 PFO-RLS 诊断方面的敏感性,可操作性强,在一定程度上可取代 TEE 成为 PFO-RLS 筛查的有效手段。对于 c -TCD 阳性、c-TTE 阴性或 c-TCD 阴性、c-TTE 阳性的隐源性脑卒中或偏头痛患者可进一步行 TEE、肺 CTA 等检查以明确病因。

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