

四肢血压影像学作用的研究进展

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【摘要】随着血压测量技术的发展,通过对四肢血压的测量衍生出了踝臂指数、臂间血压差异、踝间血压差异及趾肱指数等指标。目前的研究发现四肢血压除了与临床疾病的关系密切之外,其对影像学方面的反应日益突出。因此,通过对影像学作用的深入了解将进一步增进对四肢血压价值的认识。

【关键词】四肢血压;踝臂指数;臂间血压差异;踝间血压差异;趾肱指数;影像学

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Imaging Value of Four-limb Blood Pressure

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【Abstract】 With the development of blood pressure measurement technology, ankle-brachial index, inter-arm blood pressure difference, inter-ankle blood pressure difference, and toe-brachial index are derived through the measurement of blood pressure in the limbs. The current study found that four-limb blood pressure is not only related with the clinical disease, but also with the images. Therefore, a deeper understanding of the role of imaging will enhance the understanding of the value of four-limb blood pressure.

【Key words】 Four-limb blood pressure; Ankle-brachial index; Inter-arm blood pressure difference; Inter-ankle blood pressure difference; Toe-brachial index; Imaging

根据高血压流行病学显示,2015 年的全国高血压调查结果与 2002 年全国高血压调查的结果对比显示:中国高血压的患病率仍在上升^[1]。因此对于高血压的高度关注逐渐衍生出了四肢血压这一概念,四肢血压是通过同步测量上肢肱动脉和下肢踝动脉的收缩压和舒张压,计算不同肢体血压差值以及比值衍生出的指标。目前市面上已有四肢血压同步测量仪,根据四肢血压读数可计算出相应指标,即踝臂指数(ankle-brachial index, ABI)、臂间血压差异(inter-arm blood pressure difference, IAD)和踝间血压差异(inter-ankle blood pressure difference, IAND)。随着血压测量技术的不断发展,目前还可测量趾动脉血压,进而得出趾肱指数(toe-brachial index, TBI)。

中国有学者提出了泛血管疾病概念,泛血管疾病是一组血管系统疾病,以动脉粥样硬化为共同病理特征,危害心脏、大脑、肾脏和四肢等重要器官。动脉硬化的血管结构及功能改变引起血管重塑,进而发生血

压变化,而四肢血压通过监测这种变化发挥作用。由此可见,四肢血压在反映泛血管这一大类疾病中可能有重要作用。现就四肢血压的研究进行综述如下。

1 四肢血压

主要指标包括:ABI、IAD、IAND 和 TBI。

1.1 ABI

ABI 也叫踝肱指数,是踝动脉(常用踝部足背动脉或胫后动脉代表)收缩压与肱动脉收缩压的比值,它实际上也是反映踝臂间的收缩压差异。目前临床上 ABI 主要用于出现症状的周围动脉疾病(peripheral arterial disease, PAD)的诊断,并且可对无症状患者进行有针对性的筛查。正常情况下,踝部的收缩压高于肱动脉,非 PAD 人群中 ABI 为 1.10 ~ 1.40, ABI < 0.90 诊断 PAD 的敏感性约为 72%,特异性约为 99%^[2]。

1.2 IAD

IAD 指左、右双臂之间的血压差异,包括臂间收缩压差和臂间舒张压差,本文中所探讨的臂间血压差主

要指臂间收缩压差。一项荟萃分析结果显示 $IAD \geq 10$ mm Hg (1 mm Hg = 0.133 3 kPa) 或 ≥ 15 mm Hg 与周围血管疾病相关,敏感性低但特异性高,并且 $IAD \geq 15$ mm Hg 与脑血管病、心血管病及全因死亡率增加相关^[3]。

1.3 IAND

IAND 指左下肢踝部及右下肢踝部收缩压、舒张压的绝对差值,本文中所探讨的臂间血压差主要指臂间收缩压差。中国有团队通过对社区人群资料分析提出踝间收缩压差异正常上限为 16.7 mm Hg,因此将踝间收缩压差异升高的诊断标准定为 ≥ 15 mm Hg^[4]。

1.4 TBI

趾动脉(常指大拇趾动脉)收缩压与肱动脉收缩压的比值。有研究发现糖尿病患者中, $TBI < 0.6$ 与心血管疾病风险及全因死亡率增加相关,并且独立于 2 型糖尿病的传统危险因素,提高了预后准确性^[5]。

2 四肢血压的临床意义

随着血压测量技术的发展,反映血压的指标也随之增多,越来越多临床研究发现四肢血压与各种疾病的发生、发展及预后密切相关。因此,这些指标在临床上发挥的作用不可忽视,现将其临床意义归纳如下。

2.1 ABI

一项回顾性研究发现低 ABI 与全因死亡率、急性心肌梗死和缺血性卒中发生率升高有关^[6]。ABI 除了可用于预测脑卒中的发生外,还可帮助预测缺血性脑卒中患者认知功能障碍的发展^[7]。并且 ABI 为 0.90 ~ 0.99 与普通人群中慢性肾脏疾病发生风险增加有关,且独立于传统心血管危险因素,而在接受血液透析的肾脏疾病患者中,ABI 异常又是严重不良心血管事件的可靠预测指标^[8-9]。

2.2 IAD

有研究表明 $IAD \geq 5$ mm Hg 的高血压患者相对于 $IAD < 5$ mm Hg 的患者具有更高的脑卒中指数^[10]。IAD 异常增高除了与脑卒中的发生有关外,有研究发现 $IAD \geq 10$ mm Hg 也可能是提示脑卒中患者早期神经功能恶化和死亡率的有用指标^[11]。另外 IAD 是普通人群慢性肾脏病事件的独立预测因子^[12],而且与冠状动脉疾病的严重程度有关^[13]。

2.3 IAND

由上文可知,ABI 可用于诊断 PAD,有研究认为在具有 ≥ 1 个心血管危险因素的基层医疗人群中,IAND 对 PAD 的诊断准确性是可接受的,因此当无法测量上肢的血压时,可推荐 IAND 用于 PAD 的诊断^[14]。有研究发现 $IAND \geq 7$ mm Hg 不但可为脑卒中风险提供额

外的预测价值,而且通过受试者工作特征曲线分析发现, $IAND \geq 7$ mm Hg 对于脑卒中的预测价值优于 $ABI < 0.9$ ^[15]。也有研究发现在预测慢性肾脏疾病患者肾脏终点的进展时,IAND 是一个有用的、比 IAD 更强的预测因子^[16]。

2.4 TBI

由上文已知 ABI 用于诊断 PAD,单独使用 ABI 低估了人群中 PAD 的患病率,常规应用 TBI 可能会提高 PAD 检出率^[17],并且低 TBI 与有症状的 PAD 患者心血管病和整体死亡率有关^[18]。

3 四肢血压异常的影像学价值

四肢血压对于临床疾病的意义明确,并且在临床中已得到相关的应用,在这些临床意义中,对于四肢血压的影像学价值急需了解,而这些影像学作用能进一步增进对四肢血压异常价值的认识。

3.1 ABI 的影像学作用

低 ABI 与颈动脉斑块的形成有关,而且 ABI 的值与颈动脉斑块的厚度显著相关,即 ABI 每减少 0.01 个单位,颈动脉斑块厚度增加 0.166 3 mm^[19]。在血液透析的患者中,低 ABI 与主动脉钙化有关^[20]。经颅多普勒常被用作监测血管痉挛和相关迟发性脑缺血的非侵入性方法,而 Guan 等^[21]的一项研究发现 ABI 值降低与动脉瘤性蛛网膜下腔出血诱导的迟发性脑缺血密切相关。而且有研究发现 ABI 是经颅多普勒在急性缺血性脑卒中患者颅内动脉狭窄/闭塞的早期诊断中的合适辅助工具,并且两者组合可能有助于促进与该疾病相关的诊断过程^[22]。CT 血管造影检查,可作为在由周围动脉疾病或腰椎管狭窄症引起的跛行的确定诊断工具,而近期有研究发现,ABI 诊断由 PAD 引起跛行的敏感性和特异性分别为 85.3% 和 85.7%,阳性预测值和阴性预测值分别为 87.9% 和 82.8%,因此 ABI 是鉴别诊断小腿跛行的推荐筛查试验^[23]。ABI 值降低与磁共振成像标志物即皮质梗死、腔隙性脑梗死、脑微出血、皮质微梗死以及颅内动脉狭窄有关,因此考虑 ABI 是导致脑血管疾病进而引起神经退行性变的一个有效指标^[24]。

3.2 IAD 的影像学作用

有研究发现 IAD 与颈动脉内膜中层厚度(carotid intima-media thickness, CMT)之间存相关性, Ma 等^[25]的一项对于 IAD 与心血管疾病危险因素的相关性研究数据表明,在 1 426 例参与者中当 $IAD \geq 10$ mm Hg 时,CMT 平均值及最大值均增加。一项对接受颈动脉内膜切除术患者的研究发现, $IAD \geq 20$ mm Hg 与锁骨下动脉狭窄有显著相关性,而锁骨下动脉狭窄与围

手术期卒中、术前症状和椎动脉狭窄有关^[26]。一项对 1 063 例非心源性栓塞性缺血性卒中患者的横断面研究发现, IAD ≥ 10 mm Hg 与颅内动脉硬化存在明显的相关性^[27]。虽然大部分臂间血压差主要指收缩压差, 但有研究发现臂间收缩压差异仅与颅外动脉狭窄的存在和严重程度显著相关, 而臂间舒张压差异仅与颅内动脉狭窄的存在和严重程度相关^[28]。另外, 有研究对脑磁共振成像证实的缺血性脑卒中患者测量双侧肱动脉血压, 发现 IAD ≥ 10 mm Hg 可能是脑卒中患者脑小血管病变存在的有用指标, 而脑小血管病变是脑卒中、认知功能障碍和死亡率的重要危险因素^[29]。

3.3 IAND 的影像学作用

目前针对 IAND 的单独研究较少, 一项针对老年人高血压靶器官损害的研究发现, ABI、IAD 及 IAND 组合对心血管疾病及高血压引起的靶器官损害的价值高于其中单一指标, 在靶器官损害中尤其是颈动脉斑块、动脉硬化和左心室肥厚更明显^[30], 这些均与心血管病的发病率和死亡率密切相关, 这从侧面证明了 IAND 在影像学方面的价值不容忽视。

3.4 TBI 的影像学作用

有研究调查了中国成年人 CIMT 和颈动脉斑块与 ABI 和 TBI 的关系, 发现 CIMT 和颈动脉斑块形态与糖尿病患者的 TBI 显著相关^[31]。在严重肢体缺血血运重建术后的患者中, 手术前后 TBI 变化 ≥ 0.21 与伤口愈合及主要不良肢体事件减少独立相关^[32]。一些严重肢体缺血患者由于胫动脉钙化而具有不可压缩的血管, 研究发现 TBI 诊断在这类患者中胫动脉狭窄和闭塞的敏感性较高^[33]。

4 小结

综上所述, ABI 已成为一个成熟的指标, 在临床中广泛应用, 而 IAD、IAND 和 TBI 虽无明确指南推荐, 但从现有的研究来看, 它们的作用不容忽视, 甚至可用于补充 ABI 的不足。四肢血压除了在对临床疾病的预测及预后方面发挥重要作用, 在疾病的影像学方面的价值也不容忽视, 而中国基层医院医疗设备尚不完善, 根据中国目前医疗现状, 四肢血压这一简单易行且价格低廉的检测方式的使用再合适不过。因此, 本文呼吁诊疗过程中应重视四肢血压的测量。

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(上接第 629 页)

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