

2023 年《中国高血压防治指南》 更新临床实践

孙恕 易松

[摘要] 高血压不仅仅是目前中国患病人数最多的慢性非传染性疾病,同时也是导致城乡居民心血管疾病死亡、致残的最重要危险因素。2018 年我国成人高血压患病率处于下降趋势,但高血压患者的知晓率、治疗率和控制率已取得较好成绩,但总体仍处于较低的水平。因此,对于高血压的诊断、启动降压治疗时机、继发性高血压诊治、特殊人群高血压诊治都需要规范。我国 2022 年更新《中国高血压临床实践指南》,2023 年更新《中国高血压防治指南》,对于临床实践有指导作用,但仍有一些问题需进一步探讨。

[关键词] 高血压;诊断;治疗

Clinical practice of 2023 hypertension guidelines update

SUN Shu, YI Song

Authors' address: Department of Cardiology, Yichun People's Hospital, Yichun 336028, China

Corresponding author: SUN Shu, E-mail: sssun1@163.com

[Abstract] Hypertension is not only currently the most prevalent chronic non-communicable disease in China, but also a leading risk factor of cardiovascular death and disability among residents. Although the prevalence of adult hypertension in China is on a downward trend in 2018, diagnosis, awareness, and control of hypertension remained at a relatively low level. So, it is very important in diagnosis of the hypertension, diagnosis and treatment on secondary hypertension, timing of antihypertensive treatment, diagnosis and treatment of hypertension in special population. China updated the "China hypertension clinical practice guidelines" in 2022 and the "China hypertension prevention and treatment guidelines" in 2023, which have a guiding effect on clinical practice, but there are still some problems that need to be further explored.

[Key words] Hypertension; Diagnose; Treatment



孙恕,主任医师,宜春市人民医院副院长、胸痛中心主任。江西省介入心脏病学会冠心病介入诊疗专业委员会常务委员、冠脉诊疗组专业委员会常务委员,江西省保健学会心电生理学分会委员,宜春市“优秀青年科技后备人才”。多次获“省优秀医师”“市优秀医师”。擅长冠心病介入治疗、心律失常射频消融治疗。主持和参与省级课题多项。以第一或者通信作者发表 SCI 论文数篇。

高血压是世界范围内导致过早死亡和心血管疾病的主要原因^[1],我国成人高血压患病率约为 27.5%。近年来虽然我国高血压患者知晓率、治疗率和控制率已取得较好成绩,分别达 51.6%、45.8%和 16.8%,但总体仍处于较低水平^[2]。每年随着新的流行病学调查研究、相关疾病的研究成果发布,许多国家和地区都不定期更新高血压诊治指南。我国 2022 年更新《中国高血压临床实践指南》,2023 年更新《中国高血压防治指南》,对于临床治疗有指导作用,但仍有一些问题需进一步探讨。

1 高血压的诊断标准

世界卫生组织考虑汞污染等问题,已推广电子血压计多年,目前传统的水银式血压计已逐渐淘汰^[3]。上臂式电子血压计测量血压的准确性已经通过

DOI: 10.12124/j.issn.2095-3933.2023.3.2023-5497

作者单位:336028 宜春市人民医院心内科

通信作者:孙恕,E-mail:sssun1@163.com

国际标准化组织的认证,因此无论在家中还是在医疗场所,均建议使用上臂式电子血压计测量血压^[4-5]。目前国内外大部分指南均建议在测量血压前 30 min 内排空膀胱、避免饮酒和咖啡、避免吸烟或剧烈运动,同时多个指南均建议在安静状态下保持 5 min 再进行血压测量,测量时袖带中心和心脏处于同一水平面。测量次数按照以往指南以及临床经验,2~3 次为宜,根据血压波动取平均值^[6-8]。

2022 年《中国高血压临床实践指南》建议收缩压 (systolic blood pressure, SBP) 130~140 mmHg (1 mmHg=0.133 kPa) 和 (或) 舒张压 (diastolic blood pressure, DBP) 80~90 mmHg 的患者开始药物降压治疗。理由是未来 15 年 65% 的患者将进展为血压 $\geq 140/90$ mmHg, 同时推测药物成本符合经济学效益^[9-12], 但我国人口庞大, 卫生服务水平参差不齐, 大范围的院外危险因素筛查较难实现, 尤其在经济和交通较为落后的广大县城乡镇, 因此对于未住院患者, 笔者仍然建议采用传统的 SBP ≥ 140 mmHg 和 (或) DBP ≥ 90 mmHg 作为高血压的诊断标准。对于各省市县级医院, 尤其作为区域医疗中心, 住院患者降压治疗建议采取更加严格的标准, 同时认识到高血压的危险分层是药物起始治疗的关键, 启动降压药物治疗的时机取决于包括血压水平在内的总体心血管风险^[13]。参照 2023 年《中国高血压防治指南》, 结合笔者临床工作, 血压水平处于 130~139/85~89 mmHg 的正常高值人群在住院或体检中应充分进行心血管风险相关检查。对于其中依从性和经济条件尚可的患者, 如果心血管风险判定为高危和很高危, 临床上要立即启动降压药物治疗; 对于低危和中危, 若目前没有证据显示其可从药物降压治疗中获益, 可改善生活方式 4~12 周, 血压仍不达标再启动降压药物治疗^[14-16]。

血压是血液流动时对血管壁的冲击所产生的压力。心房颤动患者因其心室充盈程度不同, 导致每次心肌收缩产生的搏出量不同, 进而增加了血压的波动幅度^[17]。目前鲜有相关指南或共识对心房颤动患者血压测量和校准进行规定, 增加测量次数取平均值可避免误差过大。

2 高血压的治疗

对于初发高血压的年轻患者, 往往以 DBP 升高为主, 多由于交感神经兴奋、外周血管收缩所致, 首

先选择非药物治疗。指南推荐生活方式干预, 并且从 2018 年版的七部曲转变为 2023 年版的八部曲 (减少钠盐摄入、增加钾摄入, 合理膳食, 控制体重, 不吸烟, 限制饮酒, 增加运动, 心理平衡, 管理睡眠), 增加了管理睡眠的措施^[18-19]。

口服药物方面, 随着越来越多种类的药物上市, 既往指南推荐的常用降压药物包括钙离子拮抗剂 (calcium channel blocker, CCB)、血管紧张素转化酶抑制剂 (angiotensin-converting enzyme inhibitor, ACEI)、血管紧张素受体拮抗剂 (angiotensin receptor blocker, ARB)、噻嗪类利尿剂、 β 受体阻滞剂以及由上述药物组成的单片复方制剂 (single-pill combination, SPC)^[20]。2023 年《中国高血压防治指南》补充血管紧张素受体脑啡肽酶抑制剂为新的一类常用降压药物。以上 6 类降压药物和 SPC 均可作为初始和维持治疗的常用药物^[21], 但是目前尚无直接证据显示降压速度或达标时间对不同血压水平患者降压药物治疗安全性的影响存在差异^[22]。

降压达标时间方面, 对大多数高血压患者而言, 应根据病情制定理想达标时间, 门诊患者多在 4 周内或 12 周内将血压逐渐降至目标水平, 推荐患者家庭血压达标。在此基础上, 年轻、病程较短的高血压患者, 达标时间可稍快。老年人、病程较长, 有合并症且耐受性差的患者, 降压速度则可稍慢^[23-25]。

新版指南仍建议普通高血压患者通常应在早晨服药^[26], 除非明确需要控制夜间血压升高, 否则不应常规推荐睡前服用降压药物。新版指南还指出, 实现 24 h 血压控制应作为降压达标的重要内容^[27]。因此, 在临床中越来越重视平均动脉压、收缩压的 24 h 达标, 对于初发高血压或者近期血压波动较大的患者, 在调整药物治疗之前, 建议完善 24 h 动态血压监测, 在临床药师的指导下, 根据药物代谢动力学指导药物口服的剂量及服药时间, 并且及时复查 24 h 动态血压, 降低潜在的心血管病风险^[28-30]。

高血压治疗的根本目标是降低心、脑、肾与血管并发症和死亡的总危险^[31]。指南推荐有证据支持可降低心血管病发病和死亡风险的降压药物, 比如在慢性肾脏病、2 型糖尿病、代谢综合征、外周血管疾病, 降压药物中推荐 ACEI 和 ARB 优先应用, 在降压的同时可有额外获益。

我国现已进入老龄化社会, 老年性高血压日益受到关注。以我国为基础的 STEP 研究发现, 65~79 岁

老年人血压 $\geq 140/90$ mmHg 应开始药物治疗, ≥ 80 岁老年人 SBP ≥ 150 mmHg 可开始药物治疗;对于身体条件比较衰弱的老年综合征患者,启动药物治疗的时机可适当放宽。合并心血管并发症或靶器官损害、心血管风险高危者应及早启动药物降压以改善预后。目前临床实践和新版指南建议 65~79 岁老年人降压目标 $<140/90$ mmHg,如患者可耐受,可降至 $<130/80$ mmHg;80 岁及以上高龄老年人降压目标 $<150/90$ mmHg,并存多种共病或老年综合征患者降压目标需要个体化,衰弱患者 SBP 目标为 130~150 mmHg^[32-34]。同时,针对老年人脉压差较大的情况,如 DBP 较低情况下无器官供血不足表现,应以 SBP 达标作为降压目标。同样,新版指南更多的是对 SBP 范围的指导,未对 DBP 控制的范围水平作说明。

对于既往临床上棘手的难治性高血压患者,有研究结果证明了经肾动脉去肾交感神经(renal denervation, RDN)治疗高血压的有效性与安全性。要在继发性高血压鉴别诊断与治疗的基础上,考虑开展 RDN 治疗^[35]。对于排除继发病因,药物难以控制血压的心血管高风险以及药物依从性差的高血压患者,可考虑开展 RDN 治疗。RDN 治疗作为临床治疗高血压的新手段,需要在有丰富高血压诊治经验,有能力进行继发性高血压病因鉴别的团队有序开展。目前可采用多种手段进行 RDN 治疗,但主要随机临床试验使用经导管射频、超声以及局部酒精注射方法。其他器械治疗高血压的方法因研究证据有限,不适合临床广泛开展^[36]。同样,RDN 治疗的远期预后也需要进一步观察^[37]。

3 继发性高血压的诊治

随着生活水平提高及生活方式改变,门诊年轻高血压患者比例也逐年上升。建议以下几类人群进行继发性高血压的筛查:(1)患者年龄 <40 岁发生高血压;(2)新诊断的高血压;(3)难治性高血压;(4)广泛的高血压靶器官损害或者存在继发性高血压的临床线索;(5)平时血压控制良好,近期血压波动剧烈并且药物治疗方案未变的老年高血压^[38]。

常见的筛查继发性因素包括肾实质性损害、肾动脉狭窄、主动脉缩窄、睡眠呼吸暂停综合征、甲状腺疾病、肾上腺相关疾病(原发性醛固酮增多症、库欣综合征、嗜铬细胞瘤)。其中原发性醛固酮增多症目前研究较多,现已将血浆醛固酮/肾素浓度比值(aldo-

sterone to renin ratio, ARR)作为筛查指标^[39]。2020 年欧洲高血压学会的观点仍然偏向停用可能影响 ARR 水平的药物,但研究对象更贴近东亚人群的日本高血压协会指出,ACEI/ARB 类药物的使用对醛固酮和肾素的水平影响有限,不具有临床意义,在服用 ACEI/ARB 药物的基础上仍可进行 ARR 筛查工作^[40-41]。笔者在临床实践中,经常发现患者很有可能因为服用影响内分泌激素水平的口服药物而造成血压不准确,因此建议在门诊高血压治疗中将口服药物调整为 CCB 类降压药物后再入院行相关检查进行筛查。如果门诊仅仅进行药物调整控制血压,延迟继发性高血压的诊断和干预,会造成靶器官进一步损害^[42-44]。

4 小结

高血压是一种慢性病,需要终身管理。目前高血压虽然是导致居民心血管疾病发病和死亡风险增加的首要危险因素,但是随着我国高血压防治的深入,高血压及相关疾病临床研究证据的增加,高血压会在我国成为防、控、均达标的疾病。

参 考 文 献

- [1] World Health Organization. Guideline for the pharmacological treatment of hypertension in adults[R]. Geneva: World Health Organization, 2021: 1-61.
- [2] 国家心血管病中心. 中国心血管健康与疾病报告 2021[M]. 北京: 科学出版社, 2022.
- [3] Asayama K, Ohkubo T, Hoshida S, et al. From mercury sphygmomanometer to electric device on blood pressure measurement: correspondence of Minamata Convention on Mercury[J]. Hypertens Res, 2016, 39(4): 179-182. DOI: 10.1038/hr.2015.158.
- [4] Stergiou GS, Alpert B, Mieke S, et al. A universal standard for the validation of blood pressure measuring devices: Association for the Advancement of Medical Instrumentation/European Society of Hypertension/International Organization for Standardization (AAMI/ESH/ISO) Collaboration Statement[J]. J Hypertens, 2018, 36(3): 472-478. DOI: 10.1097/HJH.0000000000001634.
- [5] Park SH, Park YS. Can an automatic oscillometric device replace a mercury sphygmomanometer on blood pressure measurement? A systematic review and meta-analysis[J]. Blood Press Monit, 2019, 24(6): 265-276. DOI: 10.1097/MBP.0000000000000412.
- [6] Rabi DM, McBrien KA, Sapir-Pichhadze R, et al. Hypertension Canada's 2020 comprehensive guidelines for the prevention, diagnosis, risk assessment, and treatment of hypertension in adults and children[J]. Can J Cardiol, 2020, 36(5): 595-624. DOI: 10.1016/j.cjca.2020.02.086.
- [7] Kallioinen N, Hill A, Horswill MS, et al. Sources of inaccuracy in

- the measurement of adult patients' resting blood pressure in clinical setting: a systematic review[J]. *J Hypertens*, 2017, 35(3): 421–441. DOI: 10.1097/HJH.0000000000001197.
- [8] Umemura S, Arima H, Arima S, et al. The Japanese Society of Hypertension guidelines for the management of hypertension (JSH 2019)[J]. *Hypertens Res*, 2019, 42(9): 1235–1481. DOI: 10.1038/S41440-019-0284-9.
- [9] Han M, Chen Q, Liu L, et al. Stage 1 hypertension by the 2017 American College of Cardiology/American Heart Association hypertension guidelines and risk of cardiovascular disease events: systematic review, meta-analysis, and estimation of population etiologic fraction of prospective cohort studies[J]. *J Hypertens*, 2020, 38(4): 573–578. DOI: 10.1097/HJH.0000000000002321.
- [10] Flint AC, Conell C, Ren X, et al. Effect of systolic and diastolic blood pressure on cardiovascular outcomes[J]. *N Engl J Med*, 2019, 381(3): 243–251. DOI: 10.1056/NEJMoa1803180.
- [11] Guo X, Zhang X, Zheng L, et al. Prehypertension is not associated with all-cause mortality: a systematic review and meta-analysis of prospective studies[J]. *PLoS One*, 2013, 8(4): e61796. DOI: 10.1371/journal.pone.0061796.
- [12] Luo D, Cheng Y, Zhang H, et al. Association between high blood pressure and long term cardiovascular events in young adults: systematic review and meta-analysis[J]. *BMJ*, 2020, 370: m3222. DOI: 10.1136/bmj.m3222.
- [13] 中华医学会心血管病分会, 中华康复医学会心脏预防与康复专业委员会, 中国老年学和老年医学会心脏专业委员会, 等. 中国心血管病一级预防指南[J]. *中华心血管病杂志*, 2020, 48(12): 1000–1033. DOI: 10.3760/cma.j.cn112148-20201009-00796.
- [14] 刘军, 王薇, 刘静, 等. 门诊高血压病患者合并心血管病危险因素及血压控制现状[J]. *中华心血管病杂志*, 2013, 41(12): 1050–1054. DOI: 10.3760/cma.j.issn.0253-3758.2013.12.014.
- [15] Qi Y, Han X, Zhao D, et al. Long-term cardiovascular risk associated with stage 1 hypertension defined by the 2017 ACC/AHA hypertension guideline[J]. *J Am Coll Cardiol*, 2018, 72(11): 1201–1210. DOI: 10.1016/j.jacc.2018.06.056.
- [16] Wu S, Xu Y, Zheng R, et al. Hypertension defined by 2017 ACC/AHA guideline, ideal cardiovascular health metrics, and risk of cardiovascular disease: a nationwide prospective cohort study[J]. *Lancet Reg Health West Pac*, 2022, 20: 100350. DOI: 10.1016/j.lanwpc.2021.100350.
- [17] Pagonas N, Schmidt S, Eysel J, et al. Impact of atrial fibrillation on the accuracy of oscillometric blood pressure monitoring[J]. *Hypertension*, 2013, 62(3): 579–584. DOI: 10.1161/HYPERTENSIONAHA.113.01426.
- [18] Arnett DK, Blumenthal RS, Albert MA, et al. 2019 ACC/AHA Guideline on the primary prevention of cardiovascular disease: a report of the American College of Cardiology/American Heart Association task force on clinical practice guidelines[J]. *Circulation*, 2019, 140(11): e596–646. DOI: 10.1161/CIR.0000000000000678.
- [19] Food and Health Bureau. Diabetes and hypertension care for adults in primary care settings[EB/OL].(2022-02-18)[2022-04-21]. https://www.fhb.gov.hk/pho/files/primary_care_settings_eng.pdf.
- [20] Williams B, Mancia G, Spiering W, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension[J]. *Eur Heart J*, 2018, 39(33): 3021–3104. DOI: 10.1093/eurheart/ehy339.
- [21] Parati G, Kjeldsen S, Coca A, et al. Adherence to single-pill versus free-equivalent combination therapy in hypertension: a systematic review and meta-analysis[J]. *Hypertension*, 2021, 77(2): 692–705. DOI: 10.1161/HYPERTENSIONAHA.120.15781.
- [22] World Health Organization. Guideline for the pharmacological treatment of hypertension in adults[R]. Geneva: World Health Organization, 2021: 1–61.
- [23] Zhang Y, Zhang X, Liu L, et al. Benefits of early blood pressure control on cardiovascular outcomes: a subgroup analysis of the Felodipine Event Reduction (FEVER) study[J]. *Clin Hypertens*, 2016, 34: e36. DOI: 10.1097/01.hjh.0000491427.85692.32.
- [24] Cheong AR, Said SM, Muksan N. Time to achieve first blood pressure control after diagnosis among hypertensive patients at primary health care clinics: a preliminary study[J]. *Asia Pac J Public Health*, 2015, 27(2): NP485–494. DOI: 10.1177/1010539512472361.
- [25] Martin-Fernandez M, Vinyoles E, Real J, et al. The prognostic value of blood pressure control delay in newly diagnosed hypertensive patients[J]. *J Hypertens*, 2019, 37(2): 426–431. DOI: 10.1097/HJH.0000000000001896.
- [26] Unger T, Borghi C, Charchar F, et al. 2020 International Society of Hypertension global hypertension practice guidelines[J]. *Hypertension*, 2020, 75(6): 1334–1357. DOI: 10.1161/HYPERTENSIONAHA.120.15026.
- [27] Viera AJ, Yano Y, Lin FC, et al. Does this adult patient have hypertension? The rational clinical examination systematic review[J]. *JAMA*, 2021, 326(4): 339–347. DOI: 10.1001/jama.2021.4533.
- [28] Parati G, Stergiou G, Brien EO, et al. European Society of Hypertension practice guidelines for ambulatory blood pressure monitoring[J]. *J Hypertens*, 2014, 32(7): 1359–1366. DOI: 10.1097/HJH.0000000000000221.
- [29] Bo Y, Kwok KO, Chung VC, et al. Short-term reproducibility of ambulatory blood pressure measurements: a systematic review and meta-analysis of 35 observational studies[J]. *J Hypertens*, 2020, 38(11): 2095–2109. DOI: 10.1097/HJH.0000000000002522.
- [30] Kang YY, Li Y, Huang QF, et al. Accuracy of home versus ambulatory blood pressure monitoring in the diagnosis of white-coat and masked hypertension[J]. *J Hypertens*, 2015, 33(8): 1580–1587. DOI: 10.1097/HJH.0000000000000596.
- [31] Blood Pressure Lowering Treatment Trialists' Collaboration. Pharmacological blood pressure lowering for primary and secondary prevention of cardiovascular disease across different levels of blood pressure: an individual participant-level data meta-analysis [J]. *Lancet*, 2021, 397(10285): 1625–1636. DOI: 10.1016/S0140-673

(下转第 212 页)

- e4572. DOI: 10.7717/peerj.4561.
- [13] 李萌, 金炫佚, 马春燕, 等. 三维全自动左心容积定量技术评价左心室容积及射血分数的可行性及影响因素[J]. 中国医学影像技术, 2019, 35(1): 63–68. DOI: 10.13929/j.1003–3289.201805119.
- [14] 彭雪莲, 梁杉, 刘洁, 等. 实时三维超声心动图评价急性下壁心肌梗死患者右心房容积及功能[J]. 中国超声医学杂志, 2019, 35(10): 904–907. DOI: 10.3969/j.issn.1002–0101.2019.10.013.
- [15] 程维琴, 李嘉华, 黄美萍, 等. 心脏 MRI 在三尖瓣下移畸形诊断中的价值[J]. 中华放射学杂志, 2018, 52(3): 166–171. DOI: 10.3760/cma.j.issn.1005–1201.2018.03.002.
- [16] Trachsel LD, David LP, Gayda M, et al. The impact of high-intensity interval training on ventricular remodeling in patients with a recent acute myocardial infarction—a randomized training intervention pilot study[J]. *Clin Cardiol*, 2019, 42(12): 1222–1231. DOI: 10.1002/clc.23277.
- [17] Thackeray JT, Hupe HC, Wang Y, et al. Myocardial inflammation predicts remodeling and neuroinflammation after myocardial infarction[J]. *J Am Coll Cardiol*, 2018, 23, 71(3): 263–275. DOI: 10.1016/j.jacc.2017.11.024.
- [18] 苗俊旺, 程辉, 王智芬, 等. 经胸实时三维超声心动图评价急性心肌梗死经皮冠状动脉介入术后二尖瓣构型变化[J]. 中华超声影像学杂志, 2017, 26(11): 940–946. DOI: 10.3760/cma.j.issn.1004–4477.2017.11.006.
- [19] Mancuso FJN. Real-time three-dimensional echocardiography and myocardial strain: ready for use in clinical practice[J]. *Arq Bras Cardiol*, 2019, 113(5): 946–947. DOI: 10.5935/abc.20190179.
- [20] 潘颖洁, 陈蕊, 张玥, 等. 急性 ST 段抬高型心肌梗死患者 PCI 术后无复流现象的研究进展[J]. 中南医学科学杂志, 2021, 49(3): 358–362, 372. DOI: 10.15972/j.cnki.43–1509/r.2021.03.024.
- (收稿日期: 2021–06–03)
(本文编辑: 陈丹)

(上接第 206 页)
6(21)00590–0.

- [32] National Institute for Health and Care Excellence. Hypertension in adults: diagnosis and management[DB/OL].(2022–03–18)[2022–04–28]. <https://www.nice.org.uk/guidance/ng136/chapter/recommendations#monitoring-treatment-and-blood-pressure-targets>.
- [33] Zhang W, Zhang S, Deng Y, et al. Trial of intensive blood-pressure control in older patients with hypertension[J]. *N Eng J Med*, 2021, 385(14): 1268–1279. DOI: 10.1056/NEJMoa2111437.
- [34] Wright JT, Williamson JD, Whelton PK, et al. A randomized trial of intensive versus standard blood-pressure control[J]. *N Eng J Med*, 2015, 373(22): 2103–2116. DOI: 10.1056/NEJMoa1511939.
- [35] Lauder L, Azizi M, Kirtane AJ, et al. Device-based therapies for arterial hypertension[J]. *Nat Rev Cardiol*, 2020, 17(10): 614–628. DOI: 10.1038/s41569–020–0364–1.
- [36] Umemura S, Arima H, Arima S, et al. The Japanese Society of Hypertension guidelines for the management of hypertension(JSH 2019)[J]. *Hypertens Res*, 2019, 42(9): 1235–1481. DOI: 10.1038/s41440–019–0284–9.
- [37] Kario K, Kim BK, Aoki J, et al. Renal denervation in Asia: consensus statement of the Asia Renal Denervation Consortium[J]. *Hypertension*, 2020, 75(3): 590–602. DOI: 10.1161/HYPERTENSIONAHA.119.13671.
- [38] Kim K, Kim JY, Choi EY, et al. Prevalence and risk factors for secondary hypertension among young Korean men[J]. *Rev Cardiovasc Med*, 2020, 21(4): 627–634. DOI: 10.31083/j.rcm.2020.04.121.
- [39] Hung A, Ahmed S, Gupta A, et al. Performance of the aldosterone to renin ratio as a screening test for primary aldosteronism[J]. *J Clin Endocrinol Metab*, 2021, 106(8): 2423–2435. DOI: 10.1210/clinem/dgab348.
- [40] Mulatero P, Monticone S, Deinum J, et al. Genetics, prevalence, screening and confirmation of primary aldosteronism: a position statement and consensus of the Working Group on Endocrine Hypertension of the European Society of Hypertension[J]. *J Hypertens*, 2020, 38(10): 1919–1928. DOI: 10.1097/HJH.0000000000002510.
- [41] Naruse M, Katabami T, Shibata H, et al. Japan Endocrine Society clinical practice guideline for the diagnosis and management of primary aldosteronism 2021[J]. *Endor J*, 2022, 69(4): 327–359. DOI: 10.1507/endocrj.EJ21–0508.
- [42] Hundemer GL, Curhan GC, Yozamp N, et al. Cardiometabolic outcomes and mortality in medically treated primary aldosteronism: a retrospective cohort study[J]. *Lancet Diabetes Endocrinol*, 2018, 6(1): 51–59. DOI: 10.1061/S2213–8587(17)30367–4.
- [43] 中华医学会内分泌学会. 嗜铬细胞瘤和副神经节瘤诊断治疗专家共识(2020 版)[J]. 中华内分泌代谢杂志, 2020, 36(9): 737–750. DOI: 10.3760/cmaj.cn311282–20200629–00482.
- [44] Gonzaga CC, Gaddam KK, Ahmed MI, et al. Severity of obstructive sleep apnea is related to aldosterone status in subjects with resistant hypertension[J]. *J Clin Sleep Med*, 2010, 6(4): 363–368.
- (收稿日期: 2023–04–17)
(本文编辑: 杨丽)