Hypertension

ORIGINAL ARTICLE

Intensive Blood Pressure Lowering Improves Left Ventricular Hypertrophy in Older Patients with Hypertension: The STEP Trial

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BACKGROUND: Intensive systolic blood pressure (SBP) lowering has been increasingly used; however, its effect on cardiac remodeling remains not fully understood. This secondary analysis of the Strategy of Blood Pressure Intervention in the Elderly Hypertensive Patients trial aims to determine the changes in left ventricular hypertrophy (LVH) that occur in the context of intensive SBP lowering.

METHODS: A total of 7141 older patients with hypertension were randomly assigned to intensive treatment (SBP target, 110–130 mm Hg) or standard treatment (130 to 150 mm Hg). LVH was defined according to the Peguero-Lo Presti criteria on a standard 12-lead ECG.

RESULTS: At baseline, the prevalence of LVH (16.6% versus 16.5%) and the mean Peguero-Lo Presti value (1811 versus 1808 μV) were comparable between the treatment groups. During a median follow-up of 3.24 years, intensive SBP lowering was associated with a significantly lower risk of new LVH occurrence (hazard ratio, 0.76 [95% CI, 0.66–0.89]; *P*=0.001) and slower progression of the mean Peguero-Lo Presti index value by −23.47 μV/y (95% CI, −34.93 to −12.01; *P*=0.000). However, the rates of regression of baseline LVH did not differ significantly. Of note, the beneficial effect of intensive SBP lowering in terms of cardiovascular events (hazard ratio, 0.75 [95% CI, 0.59–0.97]) was not markedly attenuated after adjusting for LVH as a time-varying covariate (hazard ratio, 0.76 [95% CI, 0.59–0.97]).

CONCLUSIONS: Intensive SBP lowering protects against LVH development in older hypertensive patients, however, this favorable effect could not explain most of the reduction in cardiovascular events associated with intensive SBP lowering. ***(Hypertension.* 2023;80:00–00. DOI: 10.1161/HYPERTENSIONAHA.122.20732.)** • **Supplement Material**.

Key Words: blood pressure ■ cardiovascular disease ■ elderly ■ hypertrophy

See related article, pp XXX-XXX

Hypertension is the leading risk factor for cardiovascular disease worldwide, and the left ventricle is a primary target of the end-organ damage caused by elevated blood pressure (BP). The long-term increase in afterload causes the enlargement and hypertrophy of myocardium and cardiac remodeling, which results in decreased cardiac function at some point in the natural history of hypertension, despite being initially beneficial.[1] Left ventricular hypertrophy (LVH) is a well-documented pivotal biomarker of cardiac damage and

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ORIGINAL ARTICLE

NOVELTY AND RELEVANCE

What Is New?

Intensive systolic blood pressure lowering has been increasingly used, whereas its effect on left ventricular hypertrophy remains not fully understood. This article described a protective effect of intensive systolic blood pressure lowering (110 to <130 mm Hg) versus standard lowering (130 to <150 mm Hg) on left ventricular hypertrophy assessed by ECG in older patients with hypertension.

What Is Relevant?

Left ventricular hypertrophy is a well-documented harbinger of dismal prognosis. Intensive systolic blood pressure lowering was associated with a significantly reduced risk of newly developed left ventricular hypertrophy and slower progression of the mean Peguero-Lo Presti value. however, this favorable effect could not explain most of the reduction in cardiovascular events associated with intensive systolic blood pressure lowering.

Clinical/Pathophysiological Implications?

Intensified blood pressure therapeutic strategies are recommended in older hypertensive patients to obtain additional benefits in terms of ECG left ventricular hypertrophy.

Nonstandard Abbreviations and Acronyms

BP	blood pressure
HR	hazard ratio
LVH	left ventricular hypertrophy
SBP	systolic blood pressure
SPRINT	Systolic Blood Pressure Intervention Trial
STEP	Strategy of Blood Pressure Intervention in the Elderly Hypertensive Patients

an harbinger of incident cardiovascular events and mortality.[2]

Successful antihypertensive management can limit LVH and improve the clinical prognosis.[3–7] However, LVH often develops in patients receiving standard BP control.[8] Emerging evidence suggests an early change in the structure and geometry of the left ventricle in patients with high normal BP, defined as a systolic BP (SBP) of 120 to 139 mm Hg or a diastolic BP of 80 to 89 mm Hg, indicating that an intensified antihypertensive strategy might be better able to prevent cardiac hypertrophy.[9–11] Thus far, 3 randomized controlled trials consistently reported a favorable effect of intensive SBP lowering on the incidence of LVH.[12–14] However, evidence for this effect remains scant in the Asian population in which cardiac remodeling was less significant under the context of hypertension.[15] Noteworthy, despite the strong association of LVH with adverse outcomes, its role in the context of intensive SBP lowering is still not well understood and whether LVH mediates the cardiovascular benefits associated with intensive SBP deserves further interrogation.

The STEP trial (Strategy of Blood Pressure Intervention in the Elderly Hypertensive Patients) randomly assigned older patients with hypertension to intensive treatment (SBP target, 110–<130 mm Hg) or standard treatment (130–<150 mm Hg) to observe the long-term clinical prognosis,[16] all enrolled patients were provided with standard 12-lead ECG tests at baseline during follow-up. Thus, this trial provided a unique opportunity to examine the effect of intensive SBP lowering on LVH assessed by ECG[17] and the clinical prognostic value of LVH beyond intensive SBP reduction in older patients with hypertension.

METHODS

An expanded methods section is available in the Supplemental Material.

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Study Population and Design

The design and results of the STEP trial have been reported previously.[16,18] Briefly, STEP was a randomized, controlled, open-label trial that was conducted at 42 clinical centers throughout China and compared the clinical outcomes of intensive treatment (SBP target, 110–<130 mm Hg) versus those of standard treatment (130–<150 mm Hg) in a large sample of older patients with hypertension. The study inclusion criteria were as follows: age 60 to 80 years; Han ethnicity; SBP 140 to 190 mm Hg or on antihypertensive medication. The exclusion criteria were previous stroke, mental impairment, uncontrolled diabetes, or a serious life-limiting condition. Patients with both qualified ECG images at baseline and during follow-up were included in current analysis (Figure S1). The trial was approved by the ethics committee of FuWai Hospital and each clinical site and conducted in accordance with the principles outlined in the Declaration of Helsinki, and all patients provided their written informed consents.

Ascertainment of LVH

A standard 12-lead ECG was obtained at baseline, year 3, and year 4, the follow-up ECG was defined as the last available

one for each patient. The ECGs were obtained in a consistent fashion according to the standard operating procedure used at all study sites. All ECGs were interpreted centrally by 2 experienced observers blinded to patient characteristics and treatment allocation. LVH was defined by sex-specific Peguero-Lo Presti criteria, computed as summing the deepest S wave amplitude of any lead and the S wave amplitude of lead V_4 using the PR segment as the baseline with a cutoff point of ≥2300 μV for women and ≥2800 μV for men.[3] The sum of S wave amplitude of any lead and S wave amplitude of lead V_4 was also examined as a continuous variable (referred to from now onwards as the Peguero-Lo Presti index).

Intervention, Measurements, and Follow-Up

Demographic data were collected at baseline before randomization. All patients received antihypertensive medication, including olmesartan, amlodipine, and hydrochlorothiazide (if needed). Office BP was measured by a trained trial staff member using the same validated office BP monitor (Omron Healthcare Group, Kyoto, Japan). Sitting brachial BP was measured in the upper right arm using an appropriately sized cuff after 5 min of rest and calculated as the average of 3 readings obtained at 1-minute intervals. Patients were scheduled for follow-up visits at 1, 2, and 3 months and every 3 months thereafter until the end of the study. At each visit, a structured interview was performed regardless of treatment group to obtain self-reported information on cardiovascular outcomes. All events were evaluated by an independent end point adjudication committee blinded to treatment allocation.

Statistical Analysis

Continuous variables were compared between groups using 2 sample *t* tests if normally distributed and the Wilcoxon Rank-sum test if non-normally distributed. Categorical variables were compared using the likelihood ratio, χ^2 test, or Fisher exact test. Cox proportional hazards regression models with stratification of clinical sites and adjustment of potential covariables (including age, sex, body mass index, baseline SBP, diabetes, chronic heart disease, baseline total cholesterol, uric acid, baseline estimated glomerular filtration rate, smoking status, alcohol consumption, aspirin use, and statin use) were used to compare the time to first detection of LVH in patients without LVH at baseline and the time to first evidence of regression of LVH in patients with LVH at baseline. Follow-up was censored on the date of the last ECG. Interactions between treatment effect and our prespecified subgroups, namely, age (<70 years versus ≥70 years), sex, SBP tertile (≤138, >139–<151, and ≥152 mm Hg), and diabetes status, were assessed using a likelihood ratio test for interaction. To examine whether the impact of intensive treatment on the primary outcome could be explained by its impact on LVH, we examined the magnitude of attenuation of the association between intensive treatment and standard treatment with the primary outcome of STEP after adjusting for LVH or the Peguero-Lo Presti index value as a time-varying covariate. The mediation proportions were calculated using Cox proportional hazards regression models.[19]

We performed a sensitivity analysis in which we excluded 430 patients with major intraventricular conduction delay as a result of complete left or right bundle branch block, Wolf-Parkinson-White syndrome, placement of a ventricular pacemaker, and major nonspecific conduction delay (all with a QRS duration ≥120 ms) considering that evidence for an ECG diagnosis of LVH in those individuals remains debatable.[20]

All statistical analyses were performed using R software version 3.6.3 (R Foundation for Statistical Computing, Vienna, Austria). A 2-sided *P* value of <0.05 was considered statistically significant.

RESULTS

After excluding 1370 patients with missing or uninterpretable ECG data (447 at baseline and 923 at follow-up), a total of 7141 patients from the STEP trial were included in this analysis (intensive group, n=3578; standard group, n=3563). The mean age of the participants enrolled in the present trial was 66.2 years; 53.7% were women and 19.3% had diabetes. The baseline demographic and ECG characteristics of the study participants are shown according to treatment group in Table 1 (more details in Table S1) and according to whether or not LVH was present at baseline in Table S2. The baseline characteristics of the study population did not differ significantly by treatment group. The Peguero-Lo Presti value was well balanced between the intensive and standard treatment groups (1810.7 versus 1807.9 μV) and the prevalence of LVH was similar in the 2 groups (16.7% versus 16.4%). Baseline BP and fasting serum glucose were both significantly higher (*P*<0.05) in patients with LVH at baseline than in those without LVH. Body mass index and the 10-year Framingham risk score were numerically higher in patients with LVH at baseline.

Throughout a median follow-up of 3.24 years, the mean BP was at 126.8/76.5 mm Hg in the intensive treatment group and 136.2/79.3 mm Hg in the standard treatment group, resulting in a between-group difference of 10.6/2.8 mm Hg (both *P*<0.001; Figure S2 and S3). Among STEP patients without LVH at baseline (n=5959), there were 708 new cases of LVH (intensive group, n=305; standard group, n=403) occurred. Intensive versus standard BP lowering was associated with a significantly reduced risk of new LVH (hazard ratio [HR], 0.76 [95% CI, 0.66–0.89]; *P*<0.001). This protective effect of intensive treatment against new LVH was consistent across subgroups for age, sex, SBP level, and diabetes (All *P* for interaction >0.10; Figure 1). This finding remained very similar after exclusion of patients with major ventricular conduction delay (HR, 0.76 [95% CI, 0.65–0.88]; *P*<0.001; Figure S4). However, the number of cases of regression of LVH that had been present at baseline did not differ significantly between treatment groups (HR, 1.12 [95% CI, 0.94–1.33]; *P*=0.215), and these results were consistent among the above-mentioned subgroups of STEP patients (all *P* for interaction >0.10; Figure 2). The results were not materially altered after excluding patients with major ventricular conduction delay (HR, 1.10 [95% CI, 0.92–1.32]; *P*=0.287; Figure S5).

Table 1. Baseline Patient Characteristics

Characteristics	Intensive treatment (N = 3578)	Standard treatment (N = 3563)	*P* value
Age, y	66.1±4.8	66.2±4.8	0.286
Age ≥70 y, n (%)	842 (23.5)	849 (23.8)	0.769
Male, n (%)	1670 (46.7)	1640 (46.0)	0.601
Body mass index, kg/m^2	25.6±3.1	25.7±3.2	0.434
Baseline blood pressure, mm Hg			
Systolic	146.5±16.7	146.3±16.7	0.713
Diastolic	82.8±10.7	82.4±10.6	0.123
Distribution of systolic blood pressure, n (%)*			0.725
≤138 mm Hg	1160 (32.4)	1183 (33.2)	
139–151 mm Hg	1161 (32.4)	1156 (32.4)	
≥152 mm Hg	1257 (35.1)	1224 (34.3)	
Fasting serum glucose, mmol/L	6.1±1.6	6.2±1.6	0.012
eGFR<60 mL/(min·1.73m^2), n (%)	51 (1.4)	59 (1.6)	0.429
Lipid profile, mmol/L			
Total cholesterol	4.9±1.1	4.9±1.1	0.726
Triglycerides (IQR)	1.3 (1.0, 1.9)	1.3 (1.0, 1.9)	0.930
High-density lipoprotein cholesterol	1.3±0.3	1.3±0.3	0.883
Low-density lipoprotein cholesterol	2.7±0.9	2.7±0.9	0.756
Smoking, n (%)	571 (16.0)	567 (15.9)	0.959
Medical history, n (%)			
Diabetes mellitus	684 (19.1)	697 (19.6)	0.655
Hyperlipidemia	1329 (37.1)	1303 (36.6)	0.633
Cardiovascular diseases	224 (6.3)	233 (6.5)	0.426
The 10-year Framingham risk score ≥15%,† n (%)	2318/3564 (65.0)	2275/3550 (64.1)	0.400
Baseline ECG			
S_D,‡ μV	1205.9±448.6	1204.8±439.2	0.920
SV_4, μV	604.9±401.9	603.1±387.5	0.851
Peguero-Lo Presti index (S_D+SV_4), μV	1810.7±763.8	1807.9±744.2	0.875
Peguero-Lo Presti-LVH,§ n (%)	593 (16.6)	588 (16.5)	0.936

Values are presented as the mean±SD, the median (IQR), or n (%) as appropriate. eGFR indicates estimated glomerular filtration rate; IQR, interquartile range; LVH, left ventricular hypertrophy; SBP, systolic blood pressure; S_D, S wave amplitude of any lead; and SV_4, S wave amplitude of lead V_4.

*The distribution of SBP is presented as the tertile of SBP at baseline.

†A 10-year Framingham risk score of ≥15% indicates high cardiovascular risk.

‡S_D was defined as the amplitude of the deepest S wave in any lead.

§Peguero-Lo Presti-LVH was ascertained using the following sex-specific cut-off points: ≥2300 μV in women and ≥2800 μV in men.

While using random coefficient models in all patients (with and without LVH at baseline), the rate of progression of the Peguero-Lo Presti value was evidently slower in patients of the intensive treatment group than the standard treatment group by −23.47 μV/y (95% CI, 34.93 to −12.01; *P*=0.000). This protective role of intensive SBP lowering against the progression of Peguero-Lo Presti value was not limited to any subgroup in the STEP population (All *P* for interaction >0.10; Figure 3). These results were similar after excluding patients with major ventricular conduction delay (differed by −23.00 μV/y [95% CI, −34.73 to −11.28]; *P*=0.000; Figure S6). A weak but significant correlation was observed between the baseline SBP and the baseline Peguero-Lo Presti value (*r*=0.094, *P*=0.000); the same was true for the correlation between mean SBP reduction and the change in the Peguero-Lo Presti index value during follow-up (*r*=0.070, *P*=0.000).

A total of 251 primary composite events occurred in the patients with ECG data included in this analysis (n=7141). Each 1 SD (765.1 μV) increase in the mean Peguero-Lo Presti index value as a time-varying covariate was associated with a 15.6% increase in the risk of cardiovascular events (HR, 1.16 [95% CI, 1.02–1.31]; *P*=0.01). Notably, intensive treatment was associated with a 25% lower risk (95% CI 0.58–0.96, *P*=0.0221) of the cardiovascular events, which was marginally attenuated to a 24% lower risk (95% CI 0.59–0.97, *P*=0.030) after adjusting for LVH as a time-varying covariate. The mediation percentage by LVH was <1% on the effect of intensive SBP lowering on cardiovascular events. When adjusting the Peguero-Lo Presti value in the model as a time-varying continuous covariate, the magnitude of attenuation was identical (HR, 0.75 [95% CI, 0.59–0.97]; *P*=0.0304; Table 2). Consistently, mediation analyses indicated little mediation by Peguero-Lo Presti value (2.7% [95% CI, 0.4%–16.2%]; *P*=0.1075) on the effect of intensive SBP lowering on cardiovascular events. These results were very similar after excluding patients with major ventricular conduction delay (Table 2).

DISCUSSION

In this secondary analysis of data from the STEP trial, we examined the effect of intensive (versus standard) lowering of SBP on the incidence of LVH and whether this effect explains the reported cardiovascular benefits of intensive SBP lowering in older patients (aged 60–80 years) without previous stroke. The key findings were as follows: (1) compared with standard treatment, intensive treatment resulted in a significantly reduced risk of new LVH in patients without LVH at baseline; (2) the Peguero-Lo Presti index value progressed evidently more slowly on intensive treatment than on standard treatment; and 3) the favorable effect of intensive SBP lowering on LVH did not explain most of the reduction in cardiovascular events.

LVH is an adaptive response to the increased impedance to ventricular emptying as a result of increased

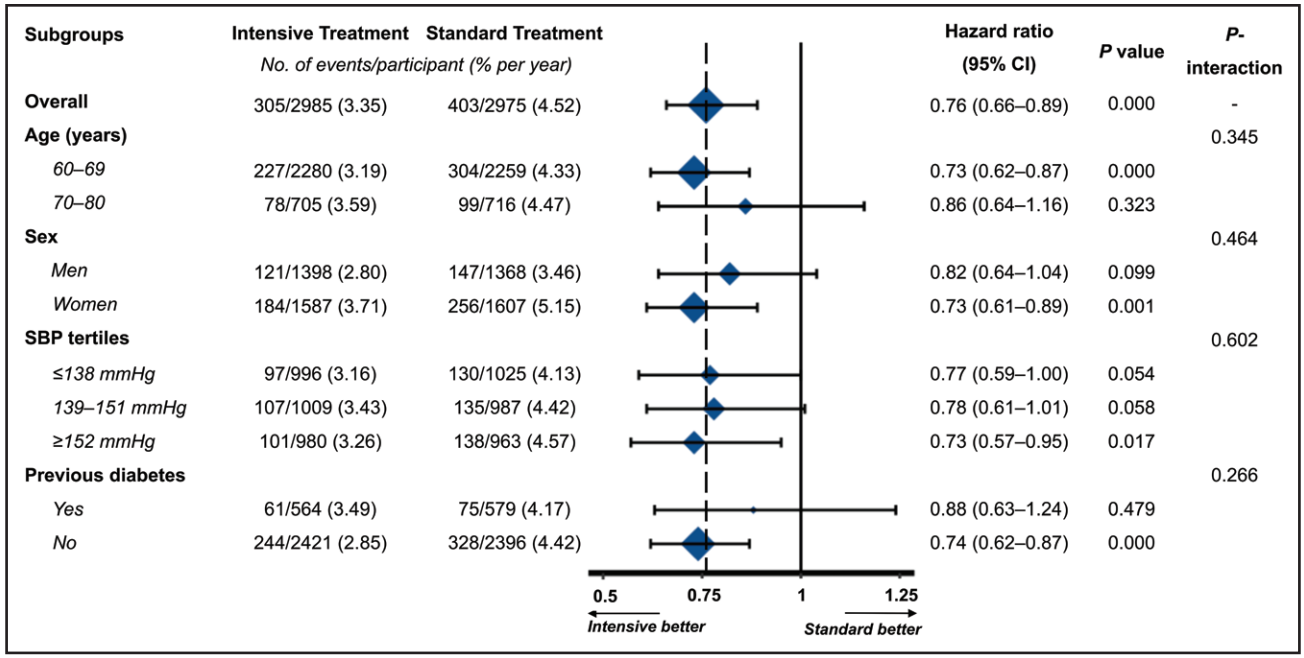

Figure 1. Forest plot showing the results of the prespecified subgroup analysis of the effect of intensive treatment vs standard treatment on the risk of new left ventricular hypertrophy during follow-up.
Results are presented as the hazard ratio (HR) and 95% CI. The dashed line represents the overall HR.

afterload occurring as a consequence of hypertension. Recent studies have reported that the incidence of LVH is higher in patients with high normal BP than in those who are normotensive.[9–11] Therefore, early and intensified prevention of LVH is of paramount importance. Three randomized trials have investigated the role of intensive SBP lowering on cardiac hypertrophy.[12–14] In the Controllo della Pressione Arteriosa Sistolica trial, lowering of SBP to <130 mm Hg (versus to <140 mm Hg) decreased the risk of ECG evidence of LVH by 39% in patients without diabetes.[14] In the Action to Control Cardiovascular Risk in Diabetes-Blood Pressure trial, intensive SBP therapy (targeting <120 mm Hg) resulted in a similar 39% reduction in risk of LVH when compared

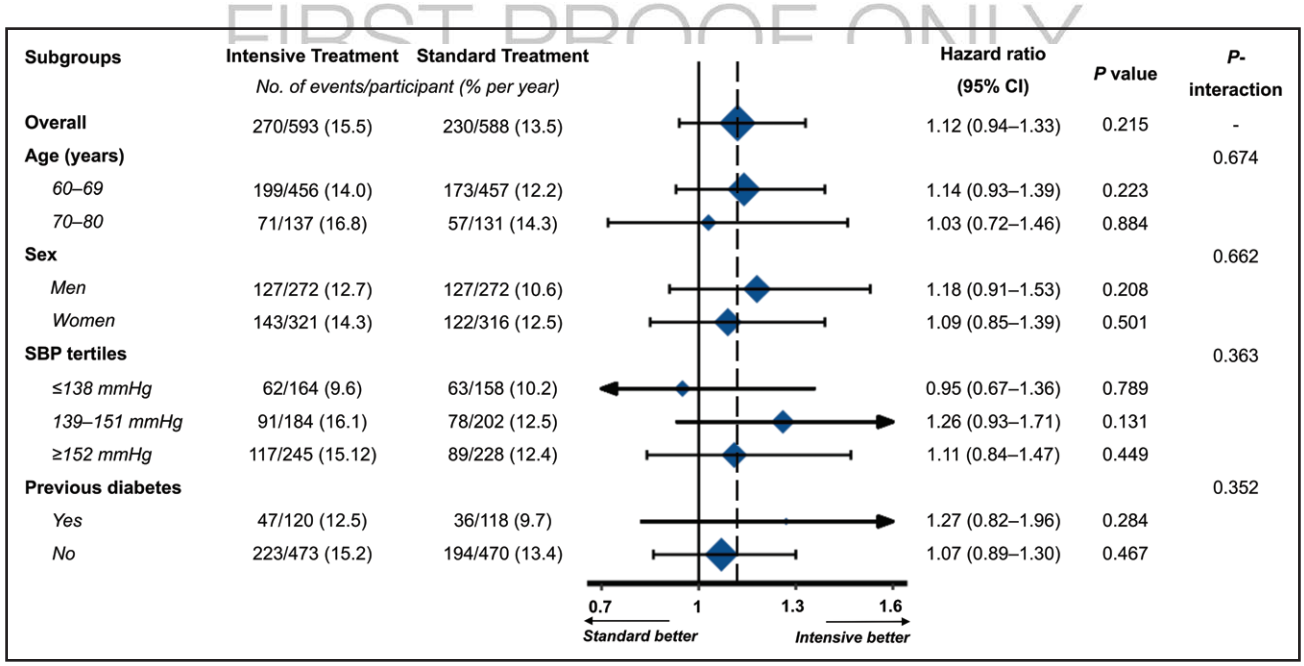

Figure 2. Forest plot showing the results of the prespecified subgroup analysis of the effect of intensive treatment vs standard treatment on the risk of regression of existing LVH during follow-up.
Results are presented as the hazard ratio (HR) and 95% CI. The dashed line represents the overall HR.

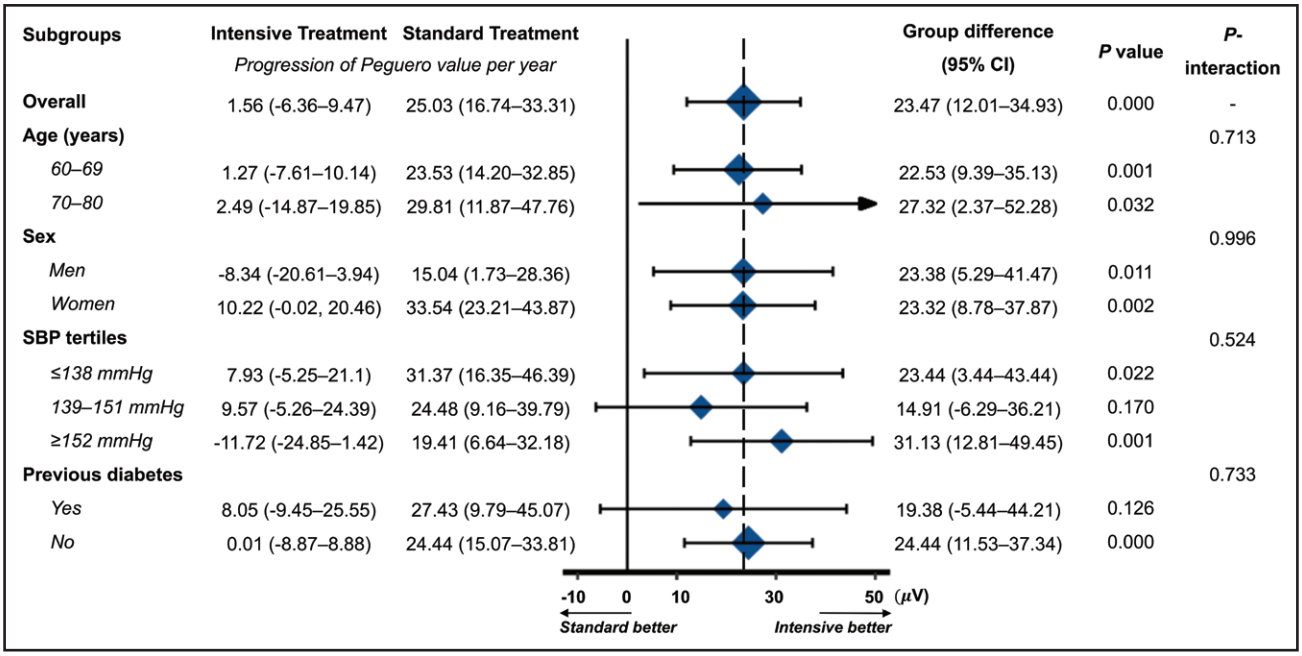

Figure 3. Forest plot of the progression of Pegeuro-Lo Presti value of intensive vs standard treatment throughout follow-up. Results are presented as the mean and 95% CI of between-group difference of the progression Pegeuro-Lo Presti value per year (μV).

with standard SBP therapy (<140 mm Hg) in patients with diabetes.[12] The SPRINT (Systolic Blood Pressure Intervention Trial) found that intensive SBP lowering (to <120 mm Hg) was associated with a 46% lower risk of developing new LVH when compared with standard SBP lowering (<140 mm Hg) in patients with high cardiovascular risk but without diabetes.[13] In line with the above findings, our current study also suggests that the risk of new LVH is lower in older patients with hypertension who receive intensive treatment (SBP target, 110–<130 mm Hg) than in those who receive standard treatment (130–<150 mm Hg). However, regression of existing LVH did not differ significantly between treatment groups. Overall, these findings strongly suggest that aggressive antihypertensive management should be instigated as soon as possible for optimal control of BP and to prevent target organ damage, given that when hypertensive target organ damage is advanced, reversal of progression may be difficult, especially in the real-world setting.

ECG remains the most widely used screening tool for LVH because of its simplicity, wide availability, and low cost in clinical practice. However, when compared with the criteria for diagnosis of LVH using cardiac imaging (eg, echocardiography and cardiac magnetic resonance), the current ECG criteria for diagnosis of LVH, which emphasize measurement of R wave amplitude, are low in sensitivity.[21,22] Depolarization of the left ventricular myocardium occurs no earlier than 50 ms after the start of ventricular depolarization.[23] Therefore, the changes in ECG voltage in patients with mild to moderate LVH are better represented by the S wave.[17] The newly proposed ECG criterion devised by Peguero-Lo Presti, calculated by summing the amplitude of the deepest S wave and the S wave in the V_4 lead, has been demonstrated to have better sensitivity for an ECG diagnosis of LVH than existing criteria in several independent cohorts.[24,25] Of note, the Peguero-Lo Presti criteria were established based on data from a White population. Therefore, the optimal cutoffs might vary depending on ethnicity. Despite this, we assumed any misclassification of LVH based on the ECG would have impacted both groups equally and that any bias should be balanced. However, the potential impact of LVH misclassification due to inappropriate cutoffs of the Peguero-Lo Presti criteria on the mediation analysis can not be fully excluded.

Development of LVH is well-known to be associated with higher incidence of cardiovascular morbidity and mortality whether detected by ECG or on imaging.[4,26–28] Nonetheless, none of above-mentioned studies showed a prognostic impact of LVH independent of blood pressure lowering. The Losartan Intervention For End Point Reduction in Hypertension Study showed less-severe LVH was predictive of a lower rate of cardiovascular events after adjusting for blood pressure reduction and other potential confounders.[5,29] On the contrary, current analysis showed a nonsignificant association between LVH and cardiovascular outcomes after adjusting for the allocation of SBP-lowering strategy. Additionally, the favorable effect of intensive SBP lowering on LVH did not explain most of the cardiovascular benefits in both current analysis and the SPRINT trial.[13,30] This suggests that the favorable cardiovascular effect of intensive SBP

Table 2. Effect of Intensive Treatment on the STEP Primary Composite Outcome With and Without Adjustment for LVH and the Peguero-Lo Presti Index as Time-Varying Covariates

Models	Hazard ratio (95% CI)	*P* value	Percentage mediation (95% CI)
Including patients with major intraventricular conduction defects			
Intensive vs standard SBP lowering	0.75 (0.58–0.96)	0.0221	…
Intensive vs standard SBP lowering with adjusting for ECG-LVH (categorical variable) as time-varying covariate*	0.76 (0.59–0.97)	0.030	<1%
Intensive vs standard SBP lowering with adjusting for Peguero-Lo Presti index (continuous variable) as a time-varying covariate†	0.76 (0.59–0.97)	0.0304	2.7% (0.4%–16.2%)
Excluding patients with major intraventricular conduction defects			
Intensive vs standard SBP lowering	0.80 (0.61–1.03)	0.0857	…
Intensive vs standard SBP lowering with adjusting for ECG-LVH (categorical variable) as time-varying covariate*	0.82 (0.63–1.05)	0.120	<1%
Intensive vs standard SBP lowering with adjusting for Peguero-Lo Presti index (continuous variable) as a time-varying covariate†	0.82 (0.63–1.06)	0.1193	2.3% (0.2%–20.9%)

LVH indicates left ventricular hypertrophy; SBP, systolic blood pressure; and STEP, Strategy of Blood Pressure Intervention in the Elderly Hypertensive Patients.

*Peguero-Lo Presti index is defined as the sum of the amplitude of the deepest S wave in any lead and the S amplitude in V_4 in μV.

†Model adjusted for baseline Cornell index value.

lowering may be through different mechanisms and LVH is one of many mediating factors. Another possible explanation is that LVH mediates the effect of intensive SBP lowering on certain cardiovascular outcomes; unfortunately, this current study is statistically underpowered to test this hypothesis. It is important to recognize that there are no data yet showing that a regression of LVH confers a beneficial effect over and above the one conferred by the BP reduction per se. Further large-scale prospective RCTs in which a strategy of therapy for LVH is compared with a strategy of blood pressure therapy alone may shed more light on the prognostic impact of LVH.

Limitations and Strengths

This study should be interpreted in the context of several limitations. First, the open-label design could lead to bias in the identification of certain end points, however, it is unlikely to impact the ascertainment of LVH since all ECGs were centrally read at an ECG core blinded to the treatment groups. Second, the STEP trial examined the effect of different SBP targets rather than the effect of specific drugs, which meant that we could not separate the impact of lowering SBP from the impact of individual medications. Third, although rigorous observer training and strict quality control measures were used, the possibility of variability in ECG measurements across sites can not be fully excluded. Furthermore, unmeasured mediators that influence cardiac hypertrophy (eg, activity of the renin-angiotensin and sympathetic nervous systems, abnormalities of lipid metabolism, inflammation) may have confounded our findings.[31] Finally, our findings may not be generalizable to patients who were excluded from the STEP trial, including those with previous stroke and those aged younger than 60 years or older than 80 years. It is important to note that mounting evidence suggest an optimal SBP target of <120 mm Hg in the elderly in terms of cardiovascular risks.[32,33] Whether an SBP target of <120 mm Hg will offer additional benefits on LVH than <130 mm Hg in older patients with hypertension, urges further exploration. The strengths of the study include its large sample size, diverse population with inclusion of both sexes and patients with diabetes, the randomized controlled study design, which resulted in balanced treatment groups at baseline, and achievement and maintenance of the intended differences in SBP between groups throughout follow-up.

Conclusions

In older patients with hypertension, the risk of new LVH and progression of the Peguero-Lo Presti value are significantly lower in patients on intensive SBP treatment (target, 110–<130 mm Hg) than in those on standard treatment (130–<150 mm Hg). However, the favorable effect of intensive SBP lowering on LVH did not explain most of the reduction in the primary outcome in STEP.

Perspectives

This current analysis from a well-designed randomized clinical trial of large sample and diverse population reported the protective effect of intensive SBP lowering (110–<130 mm Hg) on new occurrence of LVH assessed by ECGs, as compared with standard SBP lowering (130–<150 mm Hg) in older patients with hypertension. From a practical perspective, our present findings are in close agreement with previous reports, namely, that more intensive lowering of SBP achieves a greater reduction in the risk of LVH. Our findings also suggest a predictive rather than causal role of LVH on the cardiovascular benefits associated with intensive SBP lowering. Finally, our results support the need to intensify therapeutic strategies for hypertension, which affects a large proportion of the general population worldwide.

ARTICLE INFORMATION

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Disclosures

None.

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