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COMMENT

Regression of left ventricular hypertrophy

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Left ventricular hypertrophy (LVH), which is frequently caused by pressure and volume overload, has typically been associated with several disorders such as hypertension and aortic stenosis. LVH is pathologically characterized by myocyte hypertrophy and interstitial and perivascular fibrosis, with several factors contributing to its development, including catecholamines, natriuretic peptides, and peptide hormones such as angiotensin II and endothelin 1 [1]. LVH has been found to be associated with increased morbidity and mortality from cardiovascular events [2], suggesting its importance when addressing the heart as a target organ for hypertension.

Although LVH had initially been considered irreversible, recent findings have shown otherwise. One study showed that although all major antihypertensive drugs regress LVH [3], treatment with angiotensin-converting-enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), and calcium channel blockers (CCBs) was also favorably associated with improvement in LVH. A recent meta-analysis comparing the effects of ARBs, ACE inhibitors, beta-blockers, CCBs, and diuretics on LVH regression showed that ARBs were the most effective antihypertensive agents [4]. More recently, angiotensin receptor-neprilysin inhibitors have been reported to be effective in regressing hypertrophy [5]. Moreover, sodium–glucose cotransporter-2 (SGLT2) inhibitors have been reported to reduce LV mass and ambulatory blood pressure [6] and improve the prognosis of heart failure patients [7]; however, their association with improved LVH warrants further investigation.

Various unanswered questions remain regarding antihypertensive treatment and LVH regression, with the question of whether LVH is reversible in any population being one of the most clinically significant Fig. 1. In line with this, studies have shown that several factors may influence LVH regression, including age, sex, chronic kidney disease, and presence of obesity and metabolic syndrome [8]. Indeed, the present study by Chu et al. reported that antihypertensive treatment-induced LVH regression was observed more frequently in younger patients than in older adults [9]. Furthermore, a significant association between systolic blood pressure reduction and left ventricular mass index (LVMI) reduction was observed in younger patients but not in elderly patients. This is consistent with the results of another previous study [10], which suggested that LVH pathology may be reversible provided that the duration of exposure to hypertension is short but may become irreversible with extended exposure to hypertension due to progressive fibrous remodeling. This emphasizes the importance of early detection and treatment of hypertension. On the other hand, LVH regression was observed in only 27.5% of patients treated for hypertension, even among those older than 65 years. Although this figure is significantly lower than the 36.5% observed among those under 65 years of age, the results still emphasize the benefit of antihypertensive treatment in the elderly. The correlation between the degree of systolic blood pressure reduction and degree of LVMI reduction in the younger group was interesting to note, although no such correlation was observed in the elderly group. This suggests that a mechanism of LVH regression not mediated by blood pressure reduction may exist in the elderly group. Previous studies have shown that electrocardiographic LVH induced by hypertension treatment was associated with better a prognosis independent of blood pressure reduction [11]. Some medications may have a direct effect on hypertrophy by inhibiting neurohormonal factors.

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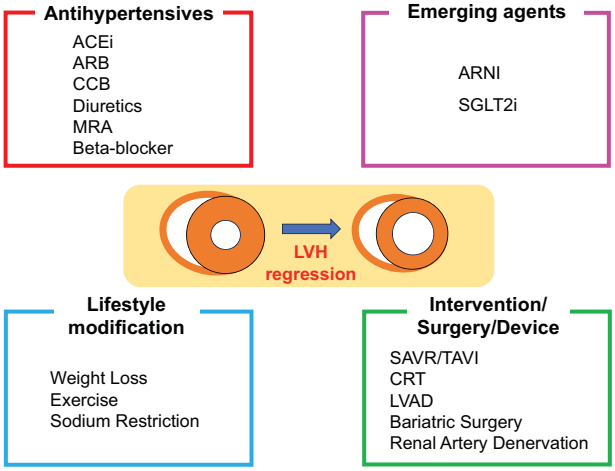

Fig. 1 Schema of pharmacological, non-pharmacological, and lifestyle modifications that contribute to recovery from left ventricular hypertrophy. ACEi angiotensin converting enzyme inhibitor, ARB angiotensin II receptor blocker, ARNI angiotensin receptor-neprilysin inhibitor, CCB calcium channel blocker, LVAD Left ventricular assist device, LVH left ventricular hypertrophy, MRA mineralcorticoid antagonist, SAVR surgical aortic valve replacement, SGLT-2i sodium–glucose cotransporter-2 inhibitor, TAVI transcatheter aortic valve implantation

Studies have reported that improvements in LVH with hypertension treatment reduce cardiovascular events and sudden death [12, 13]. In the present study, Chu et al. reported that LVH regression was associated with a decreased risk for the composite outcome of cardiovascular death and hospitalization for heart failure regardless of age, suggesting that LVH regression may be a marker of improved cardiovascular morbidity and prognosis even in elderly patients [10]. Recently, cine-mode magnetic resonance imaging has allowed for the highly accurate and reproducible evaluation of LVH, which may become clinically significant in the future [14].

LVH has been considered one of the organ damages caused by hypertension, similar to that observed in the kidneys, brain, and eyes. The underlying mechanisms associated with hypertension treatment, LVH regression, and reduction of cardiovascular diseases have yet to be fully understood. Although several factors are considered to be associated with LVH, a better understanding of LVH regression may lead to a more accurate understanding on the pathophysiology of LVH itself.

Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

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