

# Basal septal hypertrophy in patients with hypertension: a non-invasive assessment of segmental myocardial work with left ventricular pressure-strain relations

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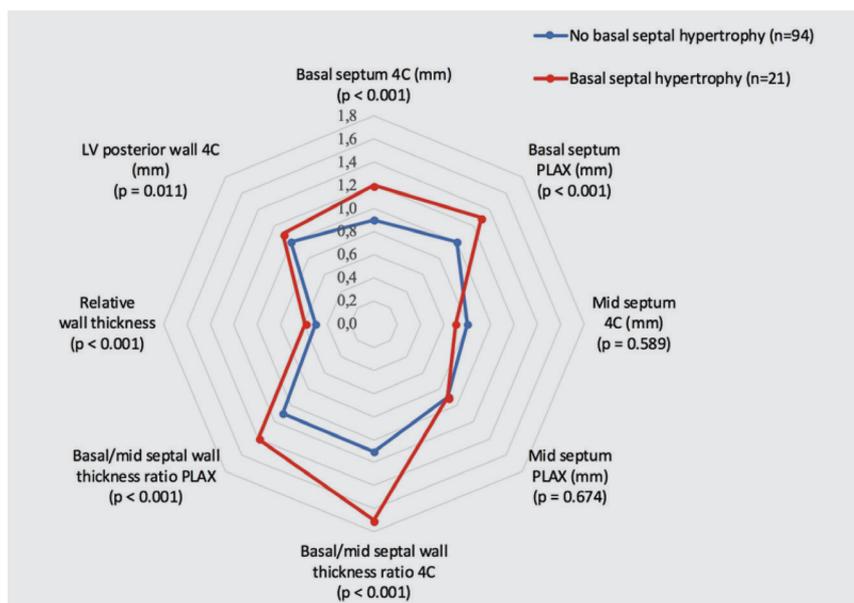
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**Background:** A subgroup of patients with chronic hypertension develop basal septal hypertrophy (BSH). Non-invasive left ventricular (LV) pressure estimates and speckle-tracking deformation curves can be used to quantify myocardial work (MW)<sup>1</sup>. Incorporation of afterload into deformation analysis demonstrates a potential advantage over isolated global longitudinal strain (GLS). The aim is to assess segmental MW indices of the septum in hypertensive patients.

**Patients and Methods:** An echocardiogram and cuff blood pressure measurement were prospectively performed on 115 patients with hypertension. The interventricular septum was measured in parasternal long axis and 4-chamber (4C) views. LV speckle-tracking was performed in 4C, 2C and 3C views. Myocardial work index (MWI), constructive work (CW), wasted work (WW), and work efficiency (WE) were calculated between mitral valve closing and opening. BSH was defined by having both a positive visual assessment of an abrupt change in septal thickness in 4C view and a basal septal-mid septal ratio  $\geq 1.4$ .

**Results:** BSH was present in 18% (n=21) of the cohort. Patients with BSH had higher systolic blood pressure at presentation. There was no group difference in cavity dimensions, LV ejection fraction, LV GLS, global MWI, CW or WW. The basal inferoseptum and anteroseptum were significantly thicker in patients with BSH (**Figure 1**). The hypertrophy was related to a decrease of longitudinal strain (LS) in the inferoseptum, but not in the anteroseptum. The segmental MWI and CW were significantly reduced in the inferoseptum of patients with BSH, whereas there was no difference in WW or WE. No differences in MW indices were notable in the basal anteroseptum (**Table 1**). There was a pronounced gradient of LS in both groups, with a decrease from apex to base. The averaged LS of the six basal segments was significantly lower in patients with BSH, with no differences in the mid or apical segments (**Figure 2**).

**Conclusion:** Basal segments are first affected in chronic exposure to increased afterload, resulting in a gradient of LS. BSH in hypertension indicates a more advanced functional impairment of the LV with further decrease in basal segment function. In this setting the basal inferoseptum is most affected, demonstrating a significant decrease in work performed between mitral valve closing and opening.



**FIGURE 1.** Comparison of LV measurements in hypertensive patients with and without basal septal hypertrophy.

LV = left ventricle; 4C = 4-chamber view; PLAX = parasternal long axis view.

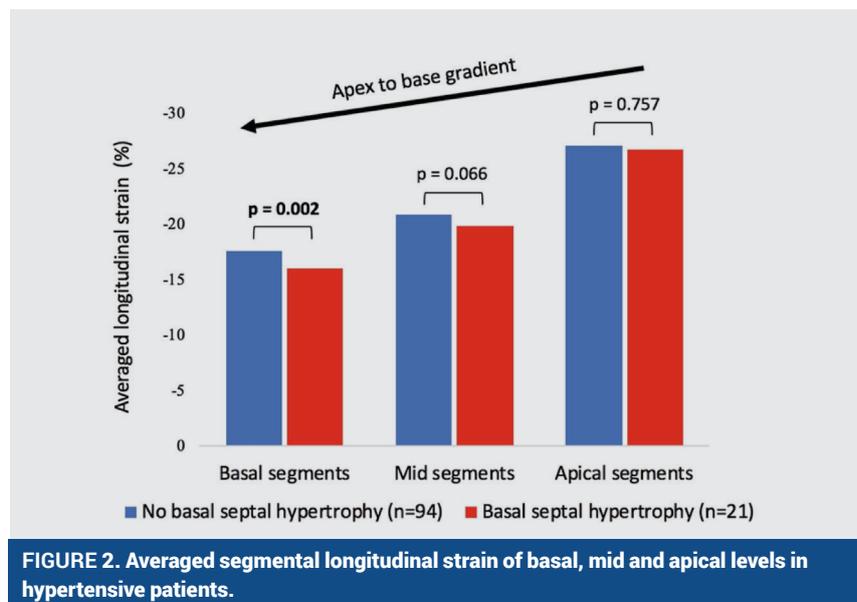
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**TABLE 1. Global and segmental longitudinal strain and myocardial work indices.**

	Patients without BSH (n=94)	Patients with BSH (n=21)	P value
LV GLS, %	-21.8 ± 2.6	-20.8 ± 2.5	0.108
Global MWI, mmHg%	2631 ± 457	2654 ± 426	0.833
Global CW, mmHg%	2852 ± 486	2906 ± 398	0.638
Global WW, mmHg%	64 (42, 88)	58 (38, 101)	0.643
Basal inferoseptal LS, %	-15.00 ± 2.84	-12.05 ± 2.65	<b>&lt;0.001</b>
Basal inferoseptal MWI, mmHg%	1724 (1516, 2045)	1441 (1181, 1519)	<b>&lt;0.001</b>
Basal inferoseptal CW, mmHg%	1881 (1580, 2166)	1500 (1324, 1747)	<b>&lt;0.001</b>
Basal inferoseptal WW, mmHg%	40 (14, 92)	16 (5, 78)	0.173
Basal anteroseptal LS, %	-17.76 ± 3.40	-17.88 ± 4.37	0.892
Basal anteroseptal MWI, mmHg%	2084 ± 500	2214 ± 518	0.288
Basal anteroseptal CW, mmHg%	2324 ± 501	2482 ± 513	0.197
Basal anteroseptal WW, mmHg%	41 (11, 74)	36 (5, 130)	0.939

BSH = basal septal hypertrophy; LV = left ventricle; GLS = global longitudinal strain; MWI = myocardial work index; CW = constructive work; WW = wasted work.

**FIGURE 2. Averaged segmental longitudinal strain of basal, mid and apical levels in hypertensive patients.****LITERATURE**

- Hubert A, Le Rolle V, Leclercq C, Galli E, Samset E, Casset C, et al. Estimation of myocardial work from pressure-strain loops analysis: an experimental evaluation. Eur Heart J Cardiovasc Imaging. 2018 Feb 26. [Epub ahead of print]. <https://doi.org/10.1093/ehjci/jey024>