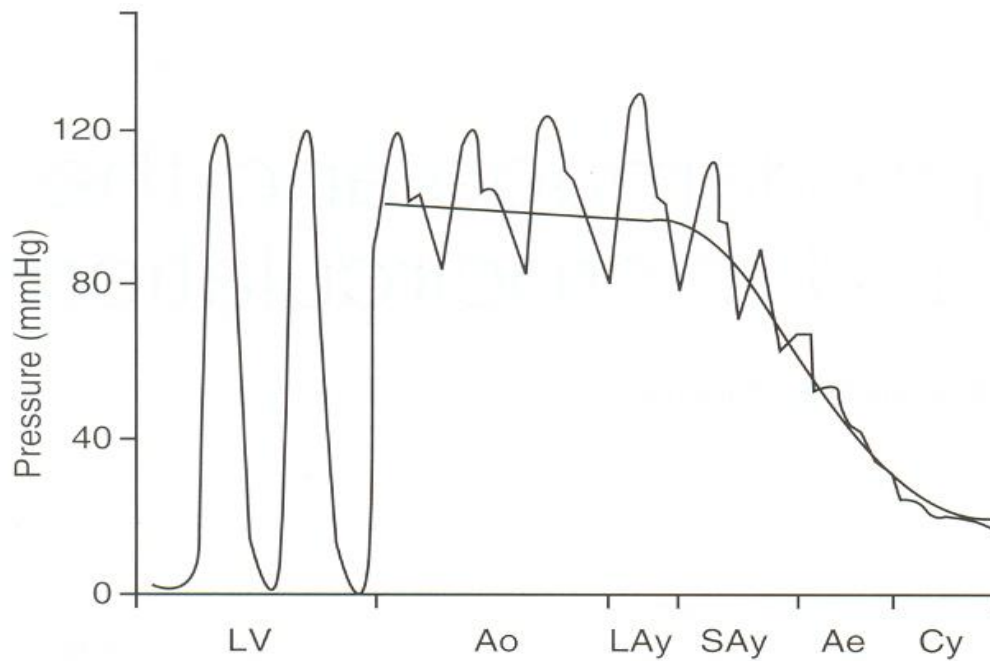


Артериална ригидност, централно аортно налягане - клинично значение и лечение

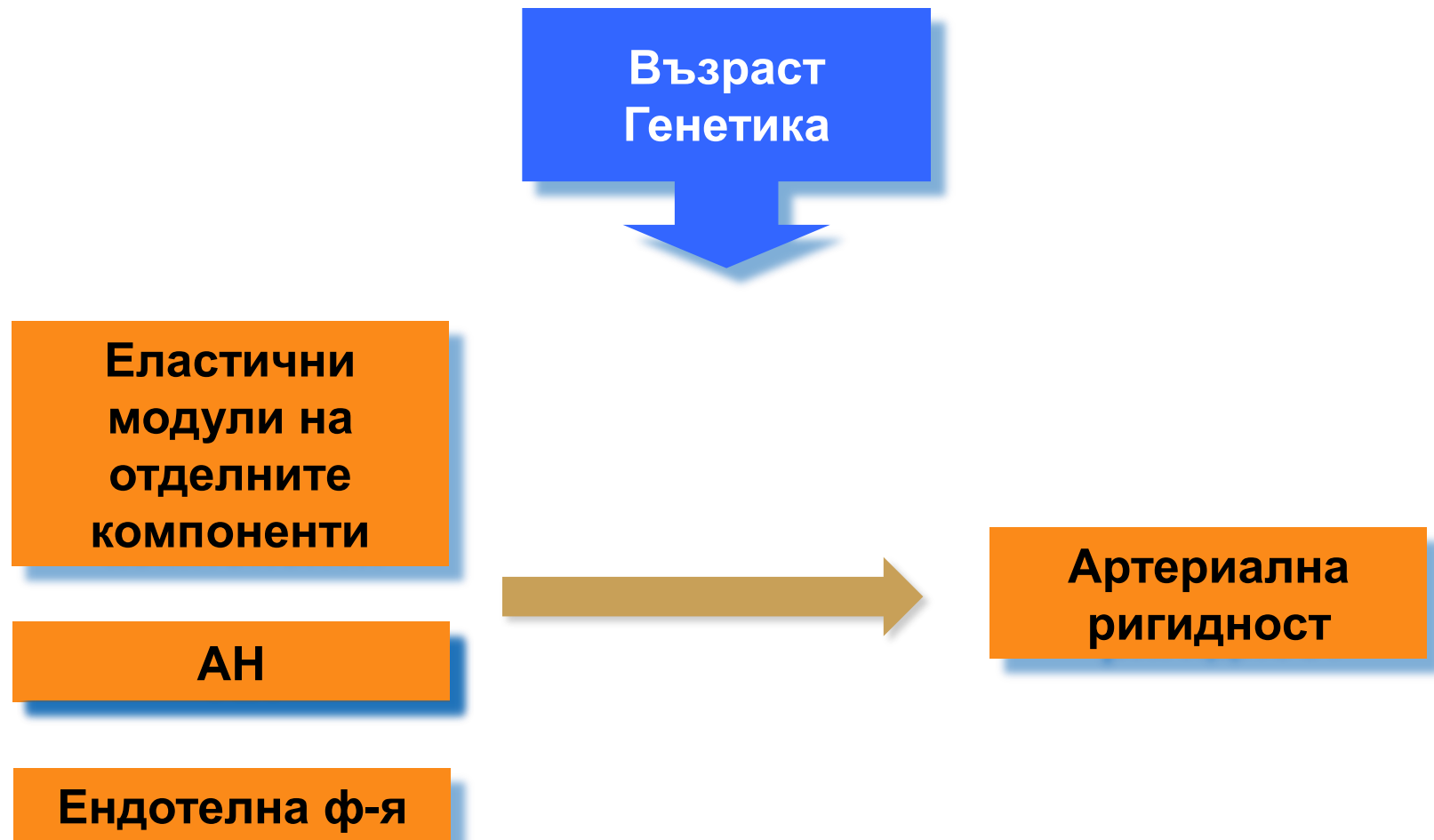
Проф. Димитър Раев, дмн
УМБАЛ “Св. Анна”

Основни функции на големите артерии

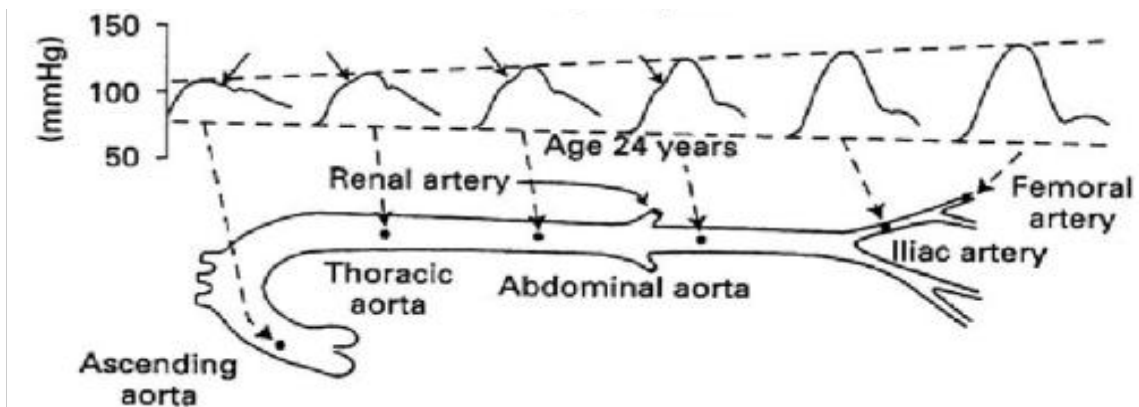
- Кондуитетна
- Амортисьорна



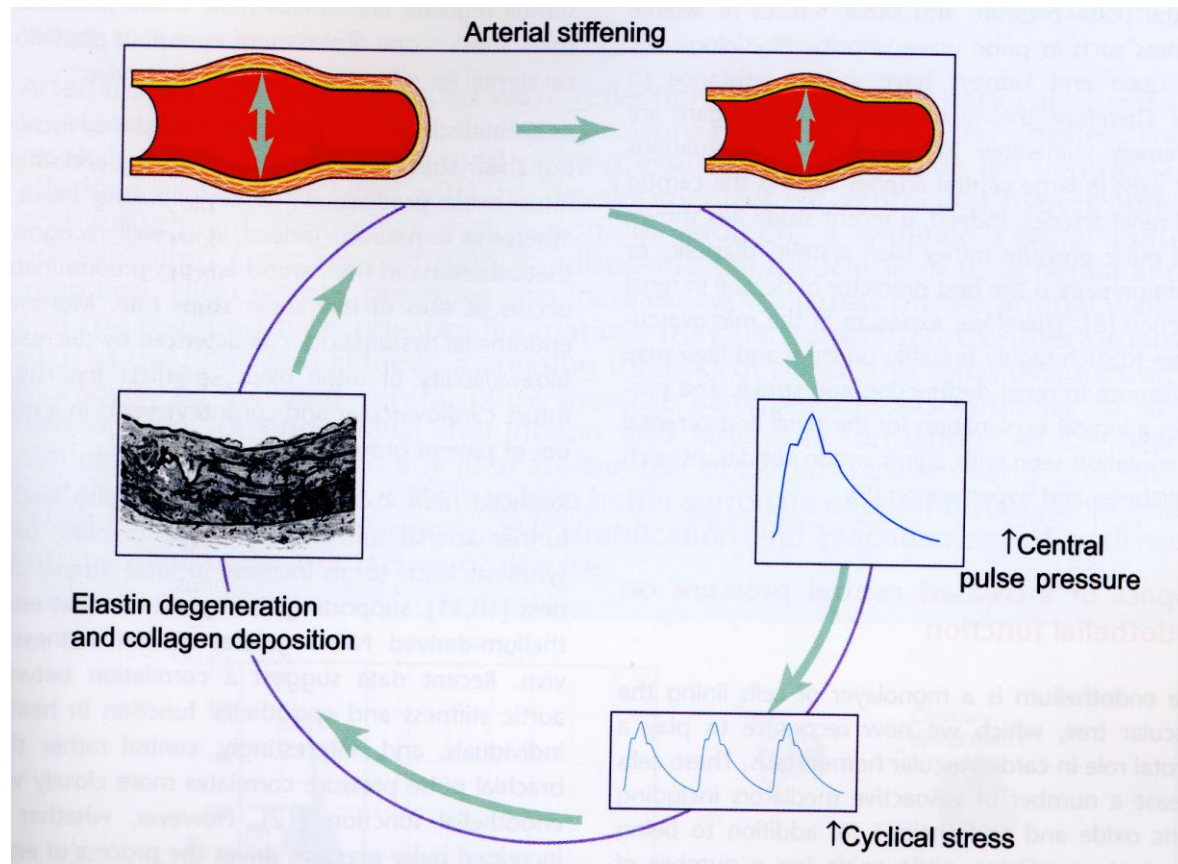
Основни детерминанти на артериалната ригидност



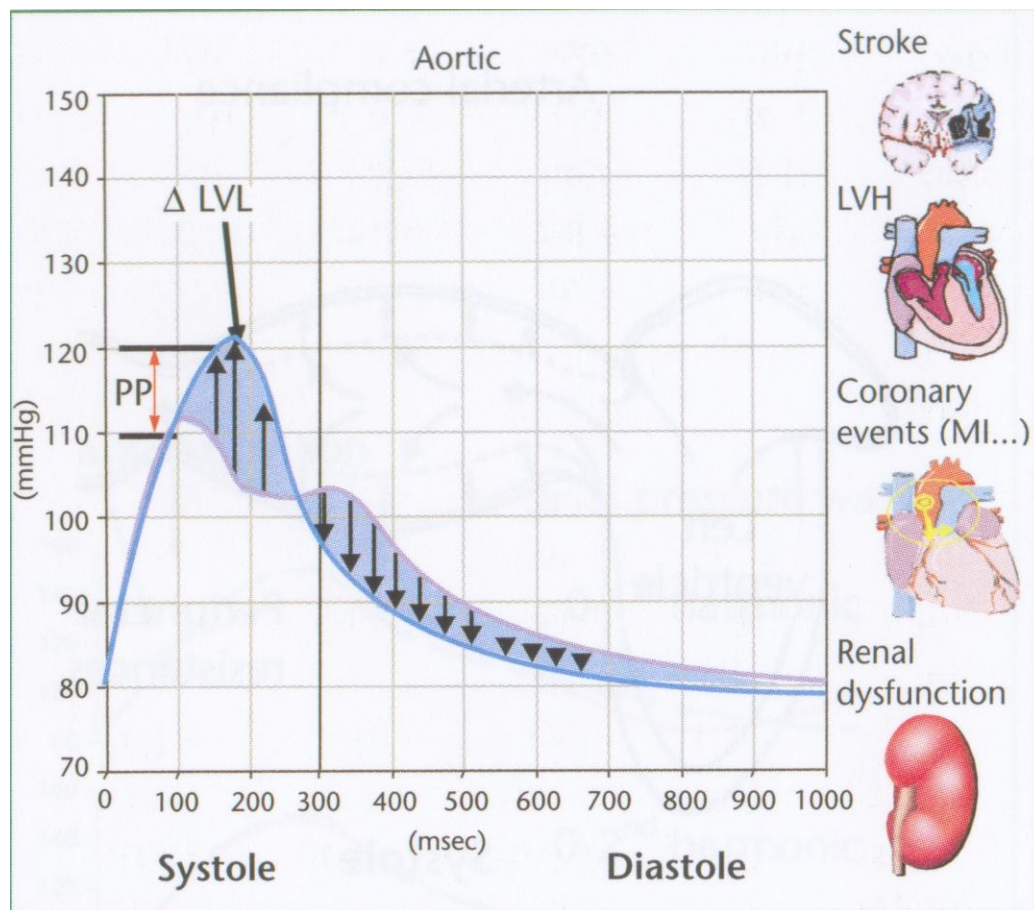
Съотношението между ЦАН и периф. АН се променя с възрастта



Централното АН и артериалната ригидност са тясно свързани



Значение на патологичната рефлекторна пулсова вълна



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Ann Intern Med
FULL TEXT

Ann Intern Med. 1991 Feb 1;114(3):202-9.

Echocardiographic left ventricular mass and electrolyte intake predict arterial hypertension.de Simone G¹, Devereux RB, Roman MJ, Schlusel Y, Alderman MH, Laragh JH.

Author information

Abstract**OBJECTIVE:** To identify predictors of arterial hypertension.**PATIENTS:** One hundred thirty-two normotensive adults from a large employed population.**METHODS:** Echocardiography, standard blood tests, and 24-hour urine collection, at baseline and after an interval of 3 to 6 years (mean, 4.7 +/- 0.8 years).**RESULTS:** At follow-up, 15 subjects (11%; 7 men, 8 women) had a systolic blood pressure greater than 140 mm Hg or a diastolic blood pressure greater than 90 mm Hg or both (mean, 143 +/- 7 and 87 +/- 6 mm Hg, respectively). At baseline, subjects who developed hypertension had a greater left ventricular mass index than those who did not (92 +/- 25 compared with 77 +/- 19 g/m² body surface area; P less than 0.005) and higher 24-hour urinary sodium/potassium excretion ratio (3.6 +/- 1.7 compared with 2.6 +/- 1.4; P less than 0.04); there were no differences in race, initial age, systolic or diastolic blood pressure, coronary risk factors, or plasma renin activity. The likelihood of developing hypertension rose from 3% in the lowest quartile of sex-adjusted left ventricular mass index to 24% in the highest quartile (P less than 0.005); a parallel trend was less regular for quartiles of the sodium/potassium excretion ratio (P less than 0.04). In multivariate analyses, follow-up systolic pressures in all subjects and in the 117 who remained normotensive were predicted by initial age, systolic blood pressure, black race, and sex-adjusted left ventricular mass index; final diastolic blood pressure was predicted by its initial value, plasma triglyceride levels, urinary sodium/potassium ratio, low renin activity, black race, and plasma glucose level.**CONCLUSIONS:** Echocardiographic left ventricular mass in normotensive adults is directly related to the risk for developing subsequent hypertension. Left ventricular mass improves prediction of future systolic pressure, whereas diastolic pressure is more related to initial metabolic status. Black race is also an independent determinant of higher subsequent blood pressure.

PMID: 1984744 [PubMed - indexed for MEDLINE]

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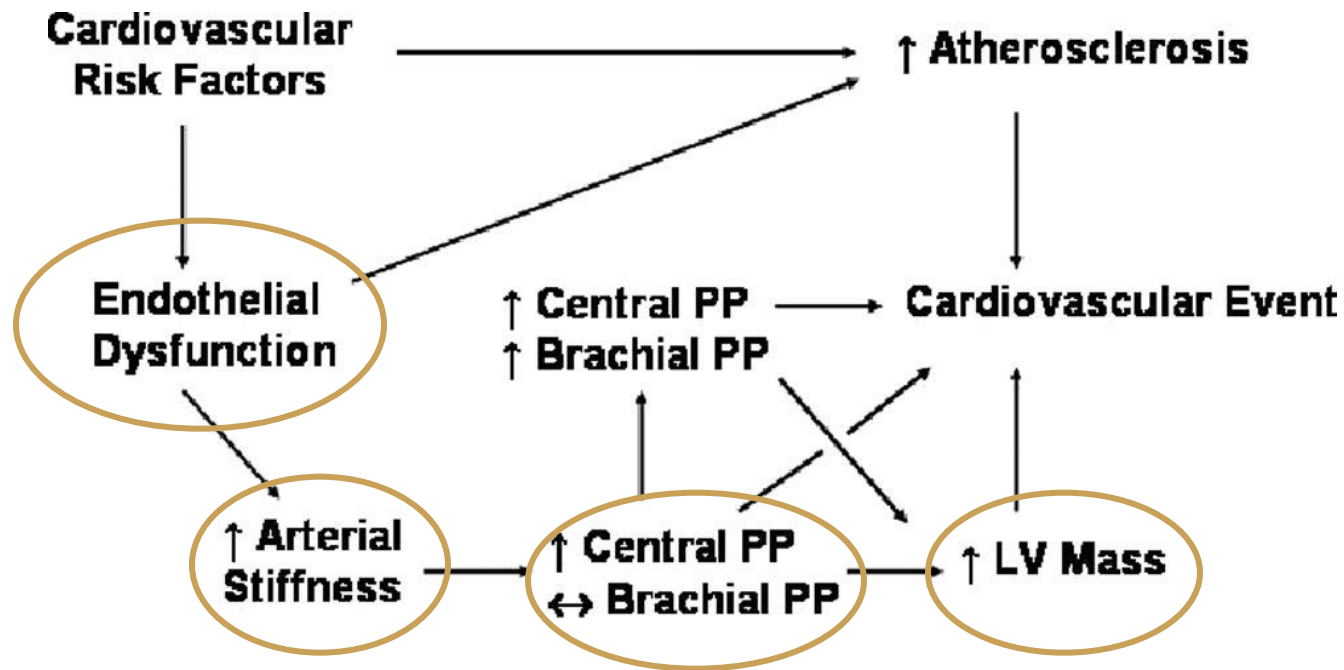
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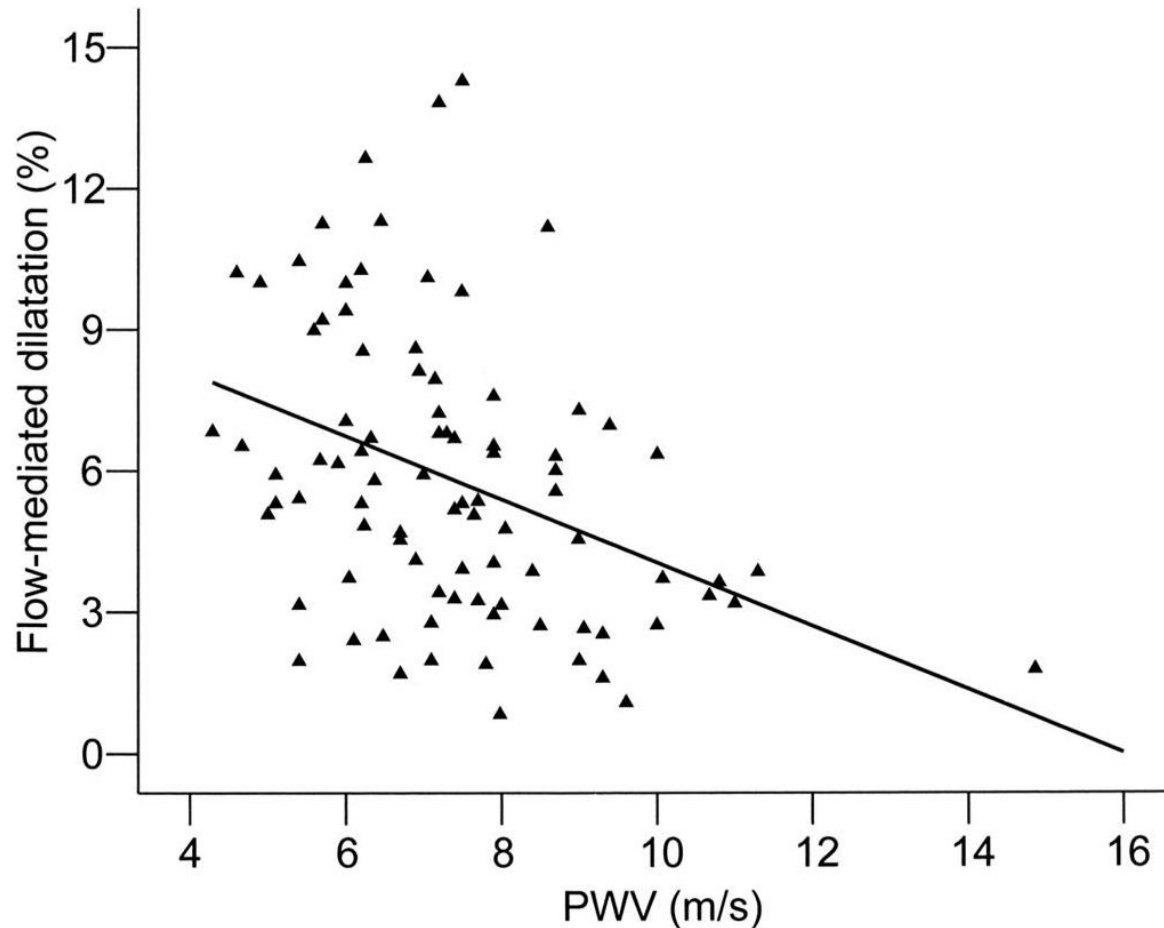
Hypertensive target organ damage and incident diabetes mellitus [J]

Lack of reduction of left ventricular mass in treated hypertension: the [J]

ЕД се асоциира с повишено ЦАН при нормално периферно АН



ЕД е детерминант на Ао ригидност и централната хемодинамика



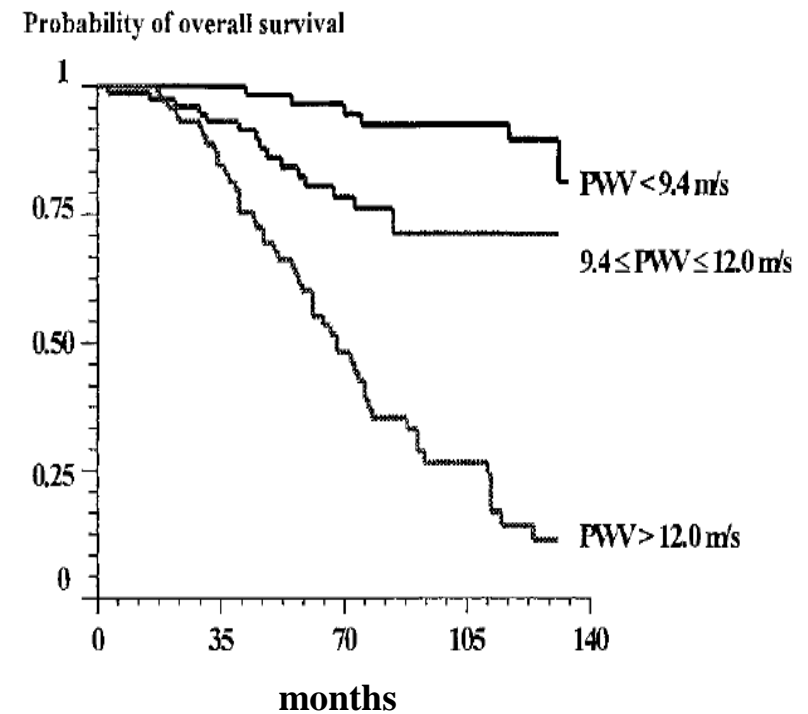
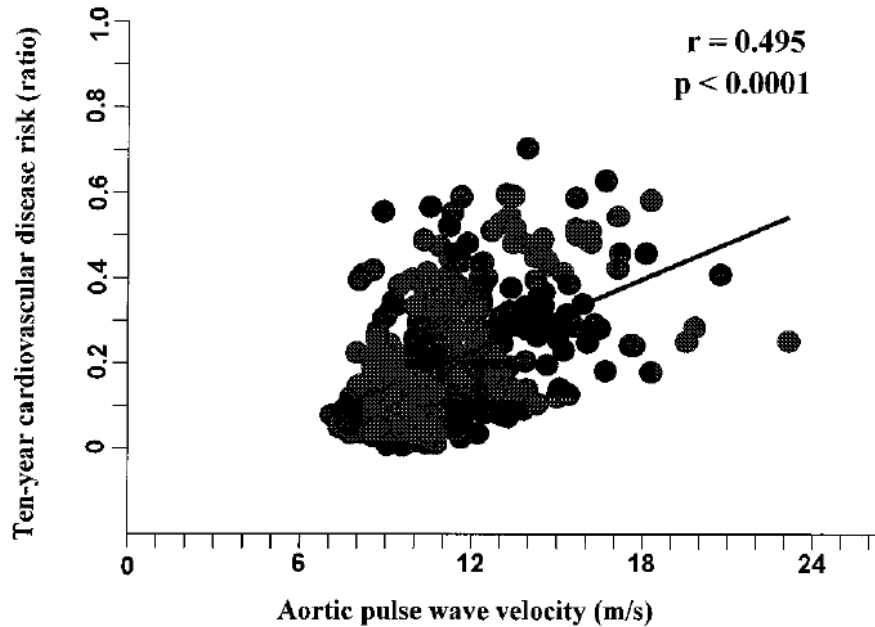
ESH/ESC guidelines 2007

- ЦАН
- Ао ригидност
- Рефлекторна вълна

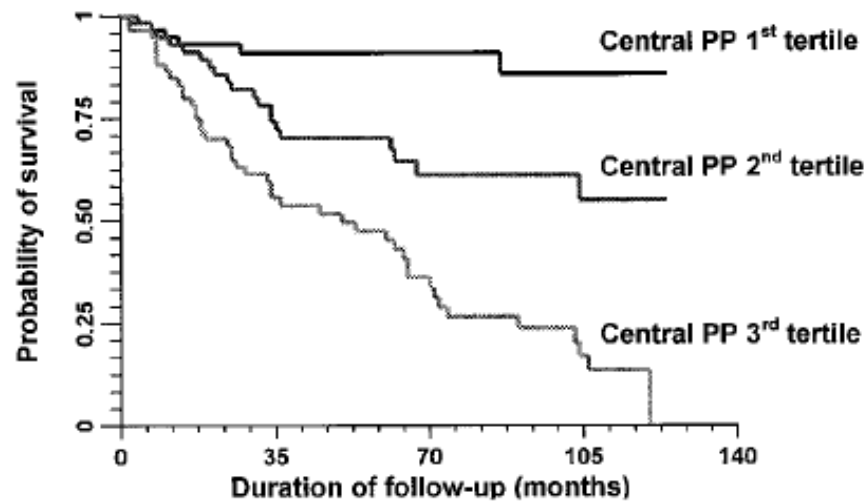


Независими предиктори на СС риск

Арт. ригидност (PWV) – независим предиктор на обща смъртност и СС риск



Централно ПН – независим предиктор на обща смъртност



Централното ПН е по-добър предиктор на СС риск, отколкото периферното АН

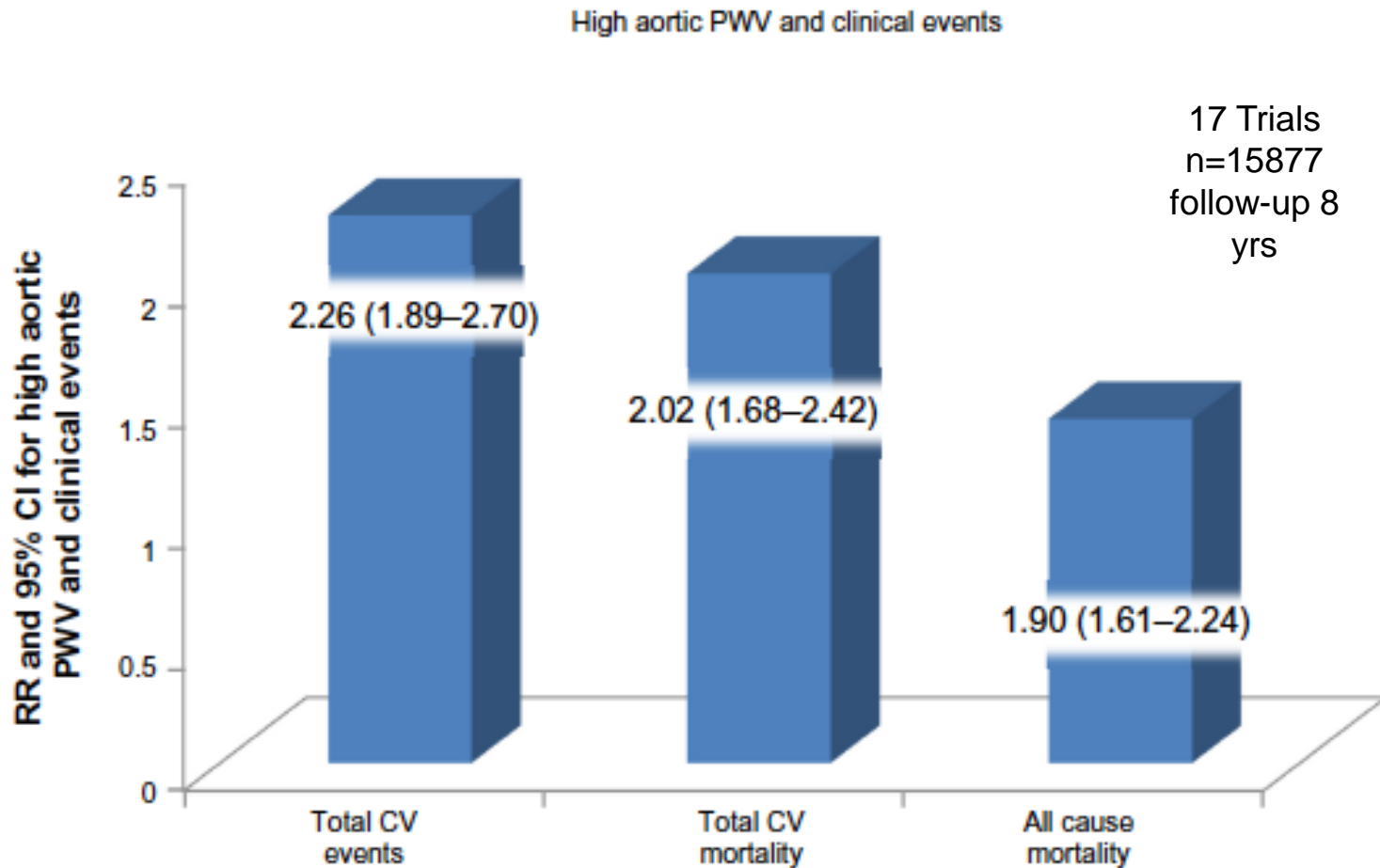
Central Pressure More Strongly Relates to Vascular Disease and Outcome Than Does Brachial Pressure

The Strong Heart Study

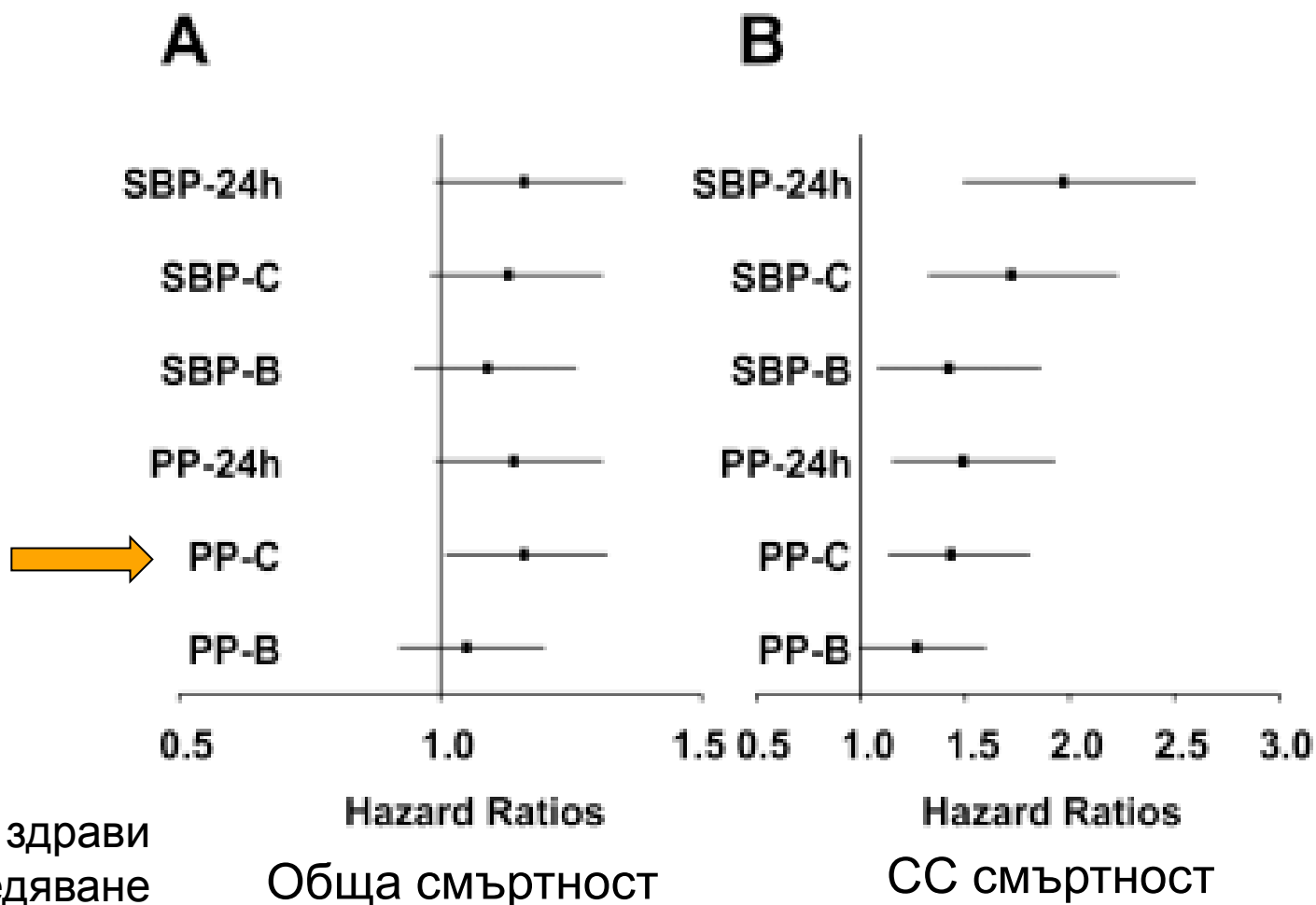
Mary J. Roman, Richard B. Devereux, Jorge R. Kizer, Elisa T. Lee, James M. Galloway, Tauqeer Ali,
Jason G. Umans, Barbara V. Howard

Abstract—Brachial blood pressure is predictive of cardiovascular outcome; however central pressure may better represent the load imposed on the coronary and cerebral arteries and thereby bear a stronger relationship to vascular damage and prognosis. Relations of brachial and central pressures to carotid artery hypertrophy (intimal-medial thickness and vascular mass), extent of atherosclerosis (plaque score), and incident cardiovascular events were examined in the Strong Heart Study. Central pressures were calculated using radial applanation tonometry. Among 3520 participants, central and brachial pulse pressures were more strongly related to vascular hypertrophy and extent of atherosclerosis than were systolic pressures. Central pulse pressure was more strongly related to all 3 arterial measures than was brachial pulse pressure ($r=0.364$ versus 0.309 for plaque score; $P<0.001$ for comparison of Spearman correlation coefficient; $r=0.293$ versus 0.249 for intimal-medial thickness; $P<0.002$; $r=0.320$ versus 0.289 for vascular mass; $P<0.05$). Among the 2403 participants free of clinical cardiovascular disease at baseline, 319 suffered fatal or nonfatal cardiovascular events during mean follow-up of 4.8 ± 1.3 years. After adjustment for age, gender, current smoking, body mass index, cholesterol:HDL ratio, creatinine, fibrinogen, diabetes, and heart rate, central pulse pressure predicted cardiovascular events more strongly than brachial pulse pressure (hazards ratio=1.15 per 10 mm Hg, $\chi^2=13.4$, $P<0.001$ versus hazards ratio=1.10, $\chi^2=6.9$, $P=0.008$). In conclusion, noninvasively-determined central pulse pressure is more strongly related to vascular hypertrophy, extent of atherosclerosis, and cardiovascular events than is brachial blood pressure. These findings support prospective examination of use of central blood pressure as a treatment target in future trials. (*Hypertension*. 2007;**50**:197-203.)

Мета-анализ: артериалната ригидност е независим предиктор на болестост и смъртност

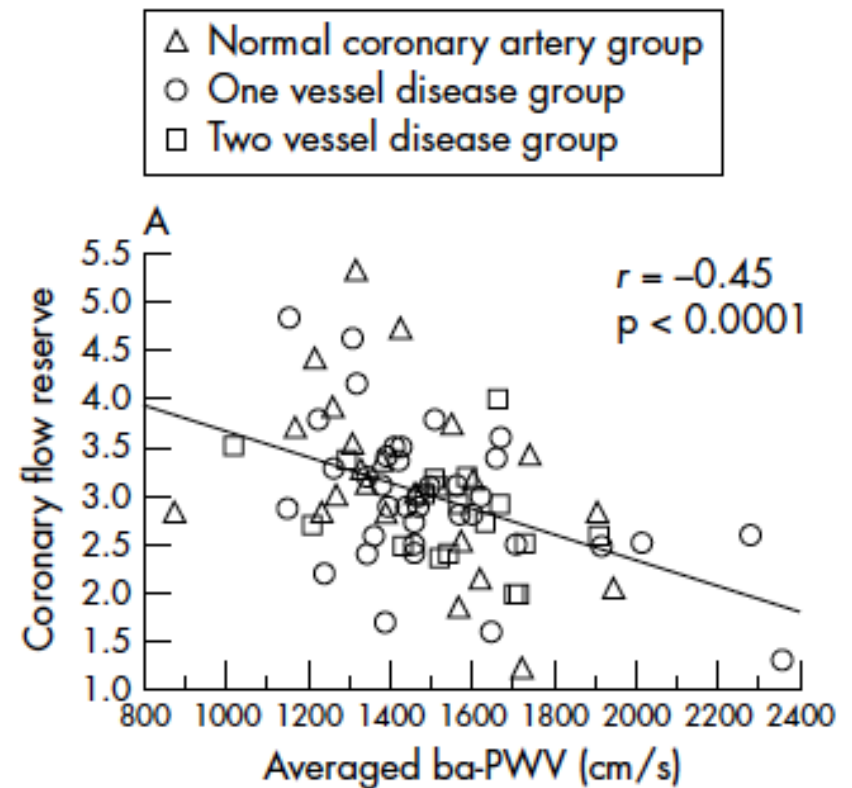
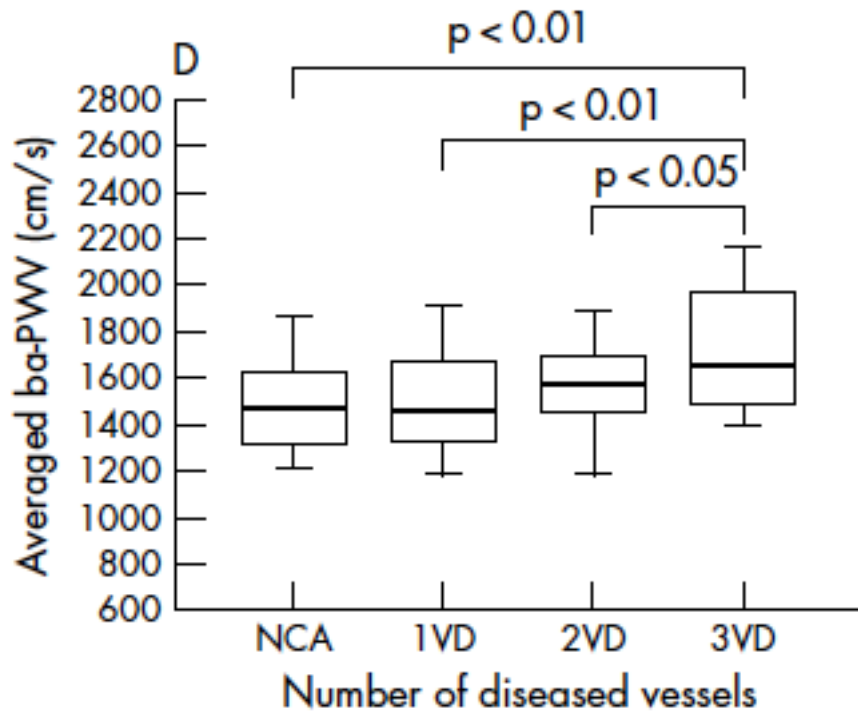


Централното ПН е по-добър предиктор на обща смъртност, отколкото 24-ч. САП и ПН



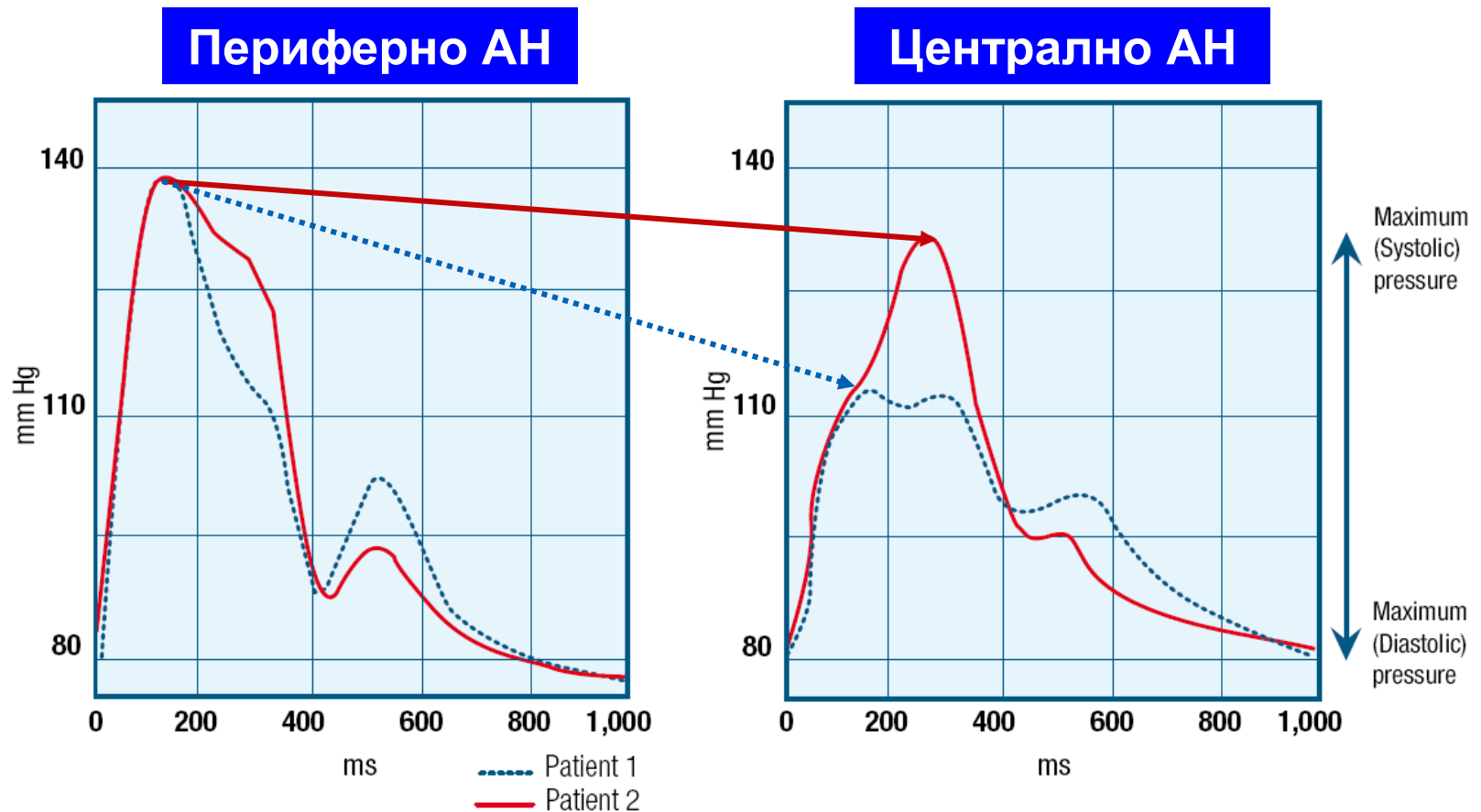
n=1014 здрави
15 г. проследяване

PWV корелира с тежестта на ИБС и коронарния резерв

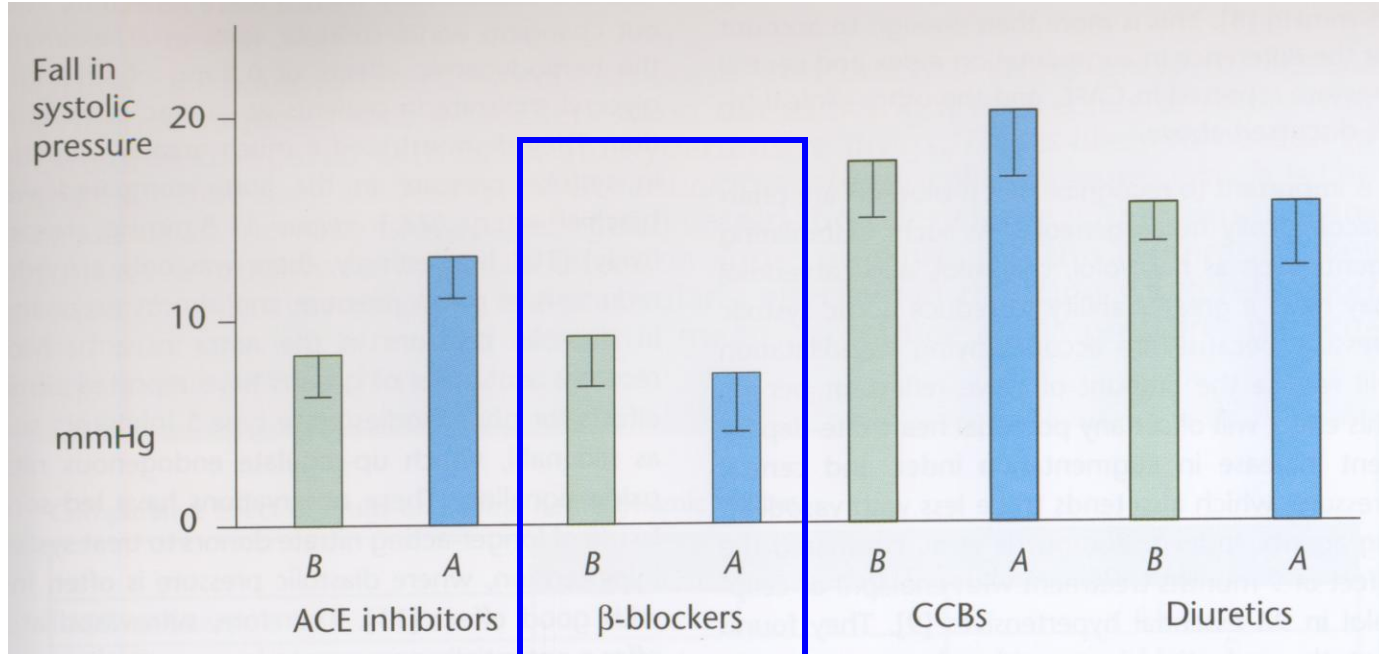


Фармакодинамика на централното АН

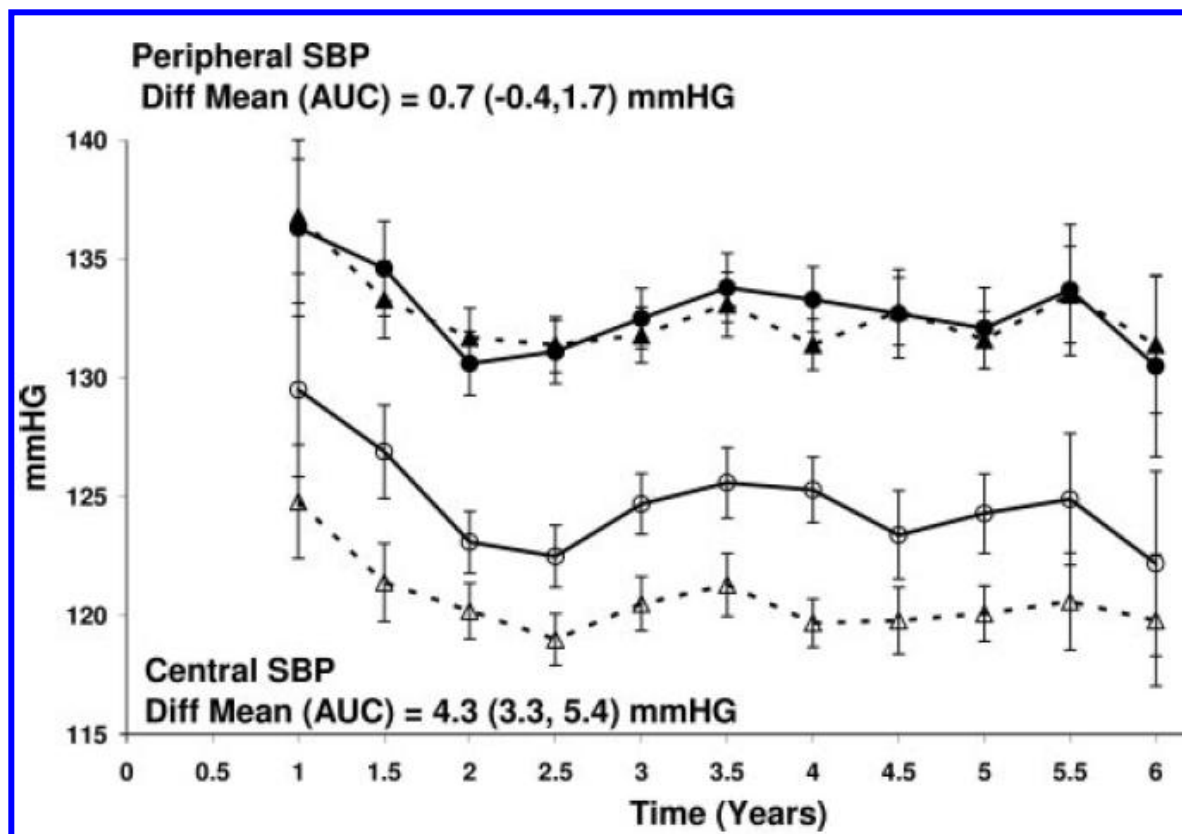
По периферното налягане не може да се съди за ЦАН



Периферното АН надценява постигнатата с ББ редукция на централното АН и подценява тази с АСЕ инх. и КА



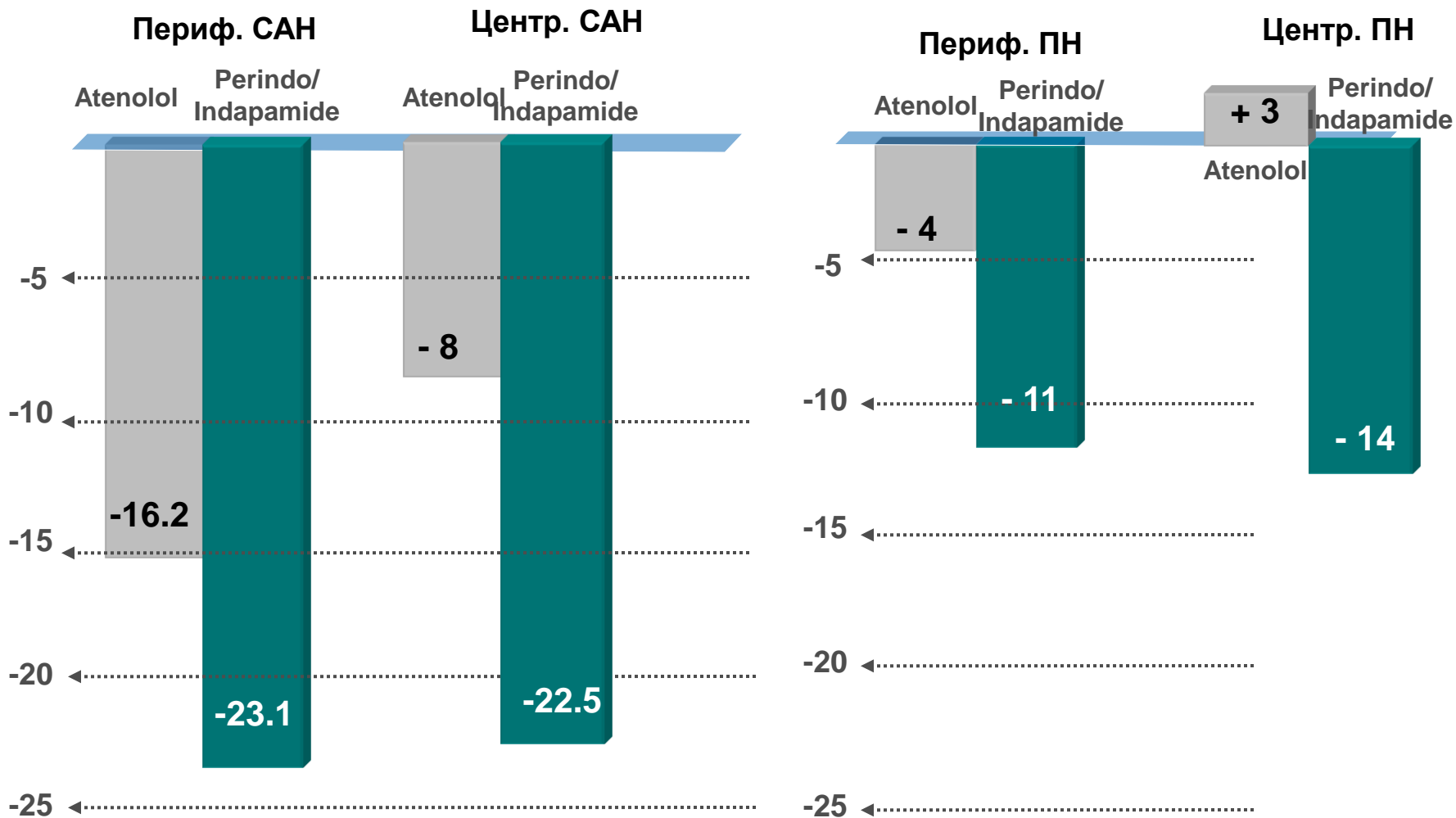
САФЕ: КА+АСЕинх. понижават ЦАН в по-голяма степен от ББ+Диуретик



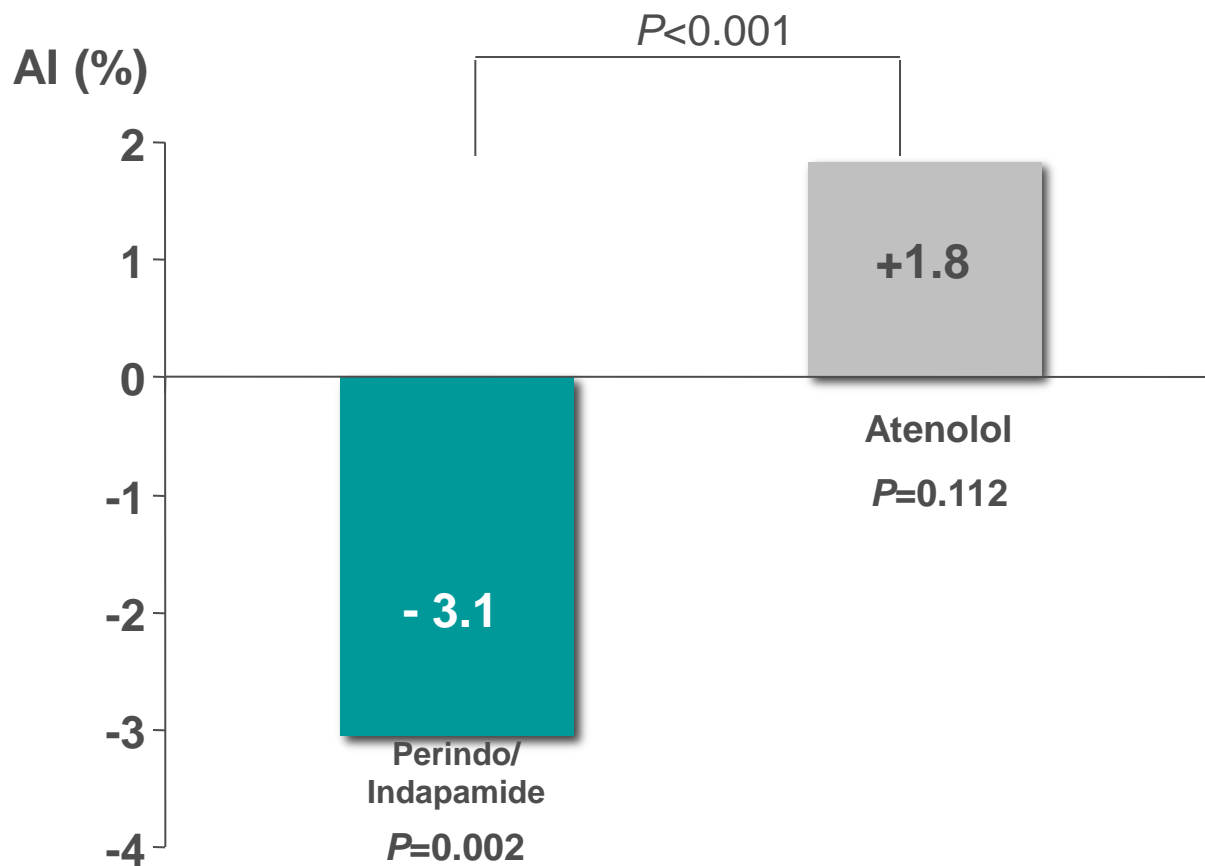
Atenolol+Thiazide

Amlodipine+Perindopril

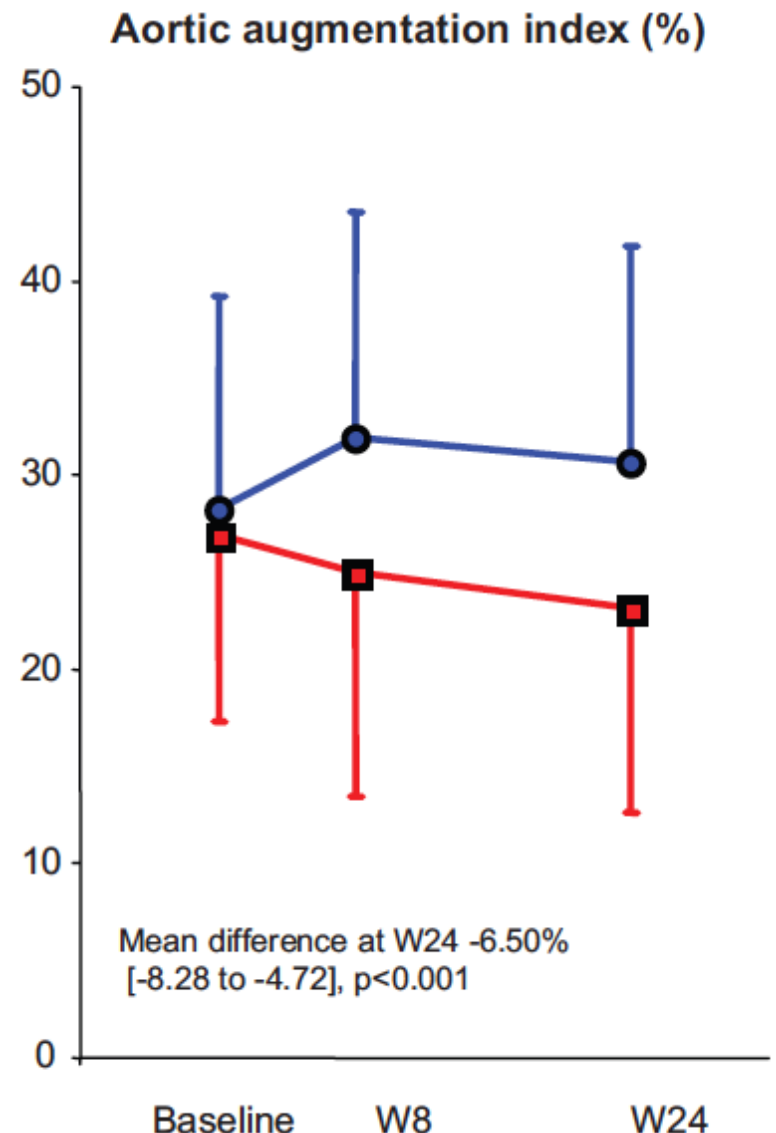
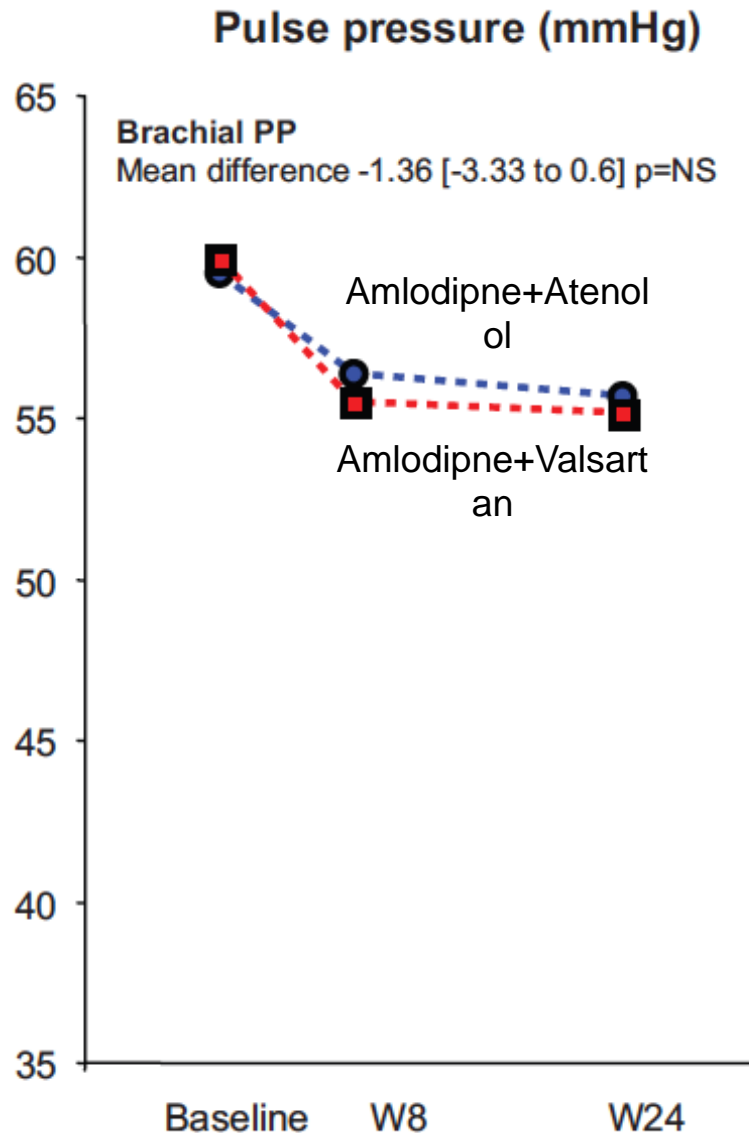
REASON: ACEинх. + тиазидоподобен диуретик редуцират по-силно ЦАН, отколкото ББ



REASON: Значително намалява AI и артериалната ригидност



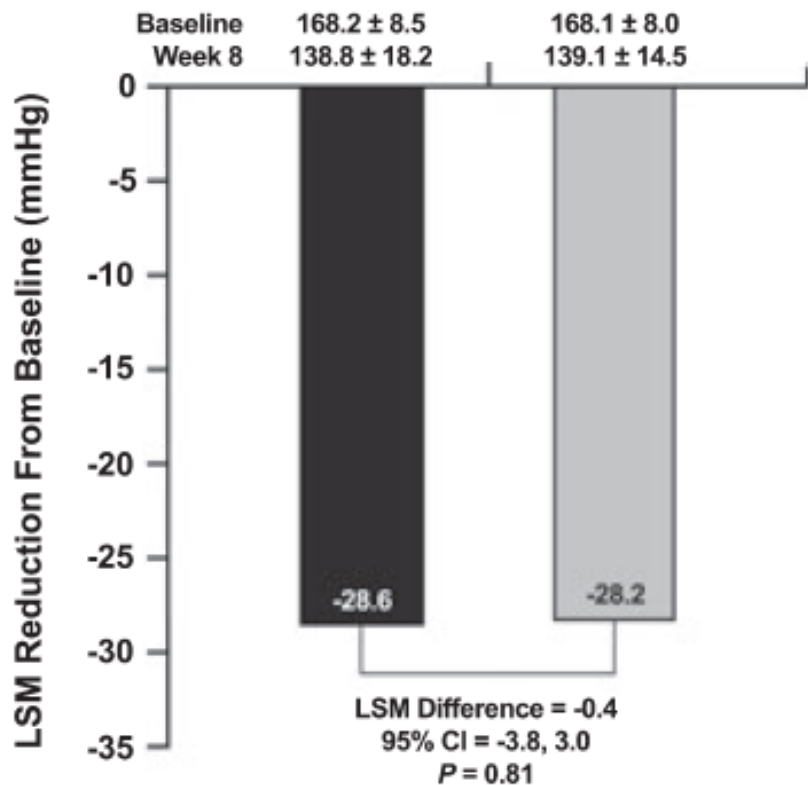
EXPLOR: Дори в комбинация с КА, ББ редуцират по-слабо центр. ПН и рефл. вълна



ATLAAS: Комбинацията DRI+HCTZ е по-ефективна за редукция на ЦАН, отколкото КА

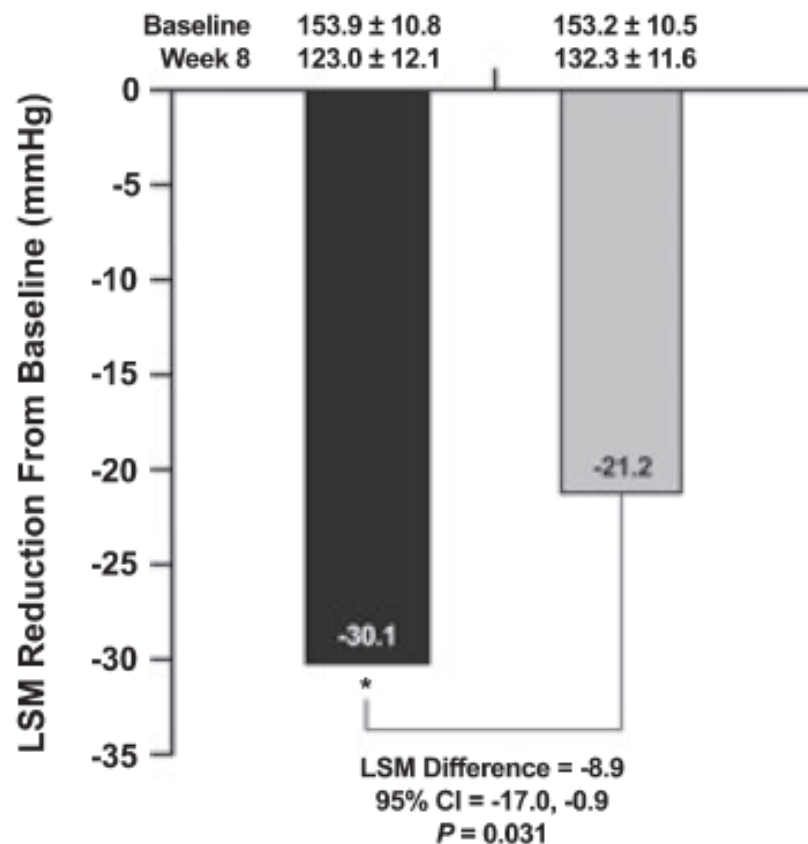
A.

Peripheral MSSBP



B.

Central SBP

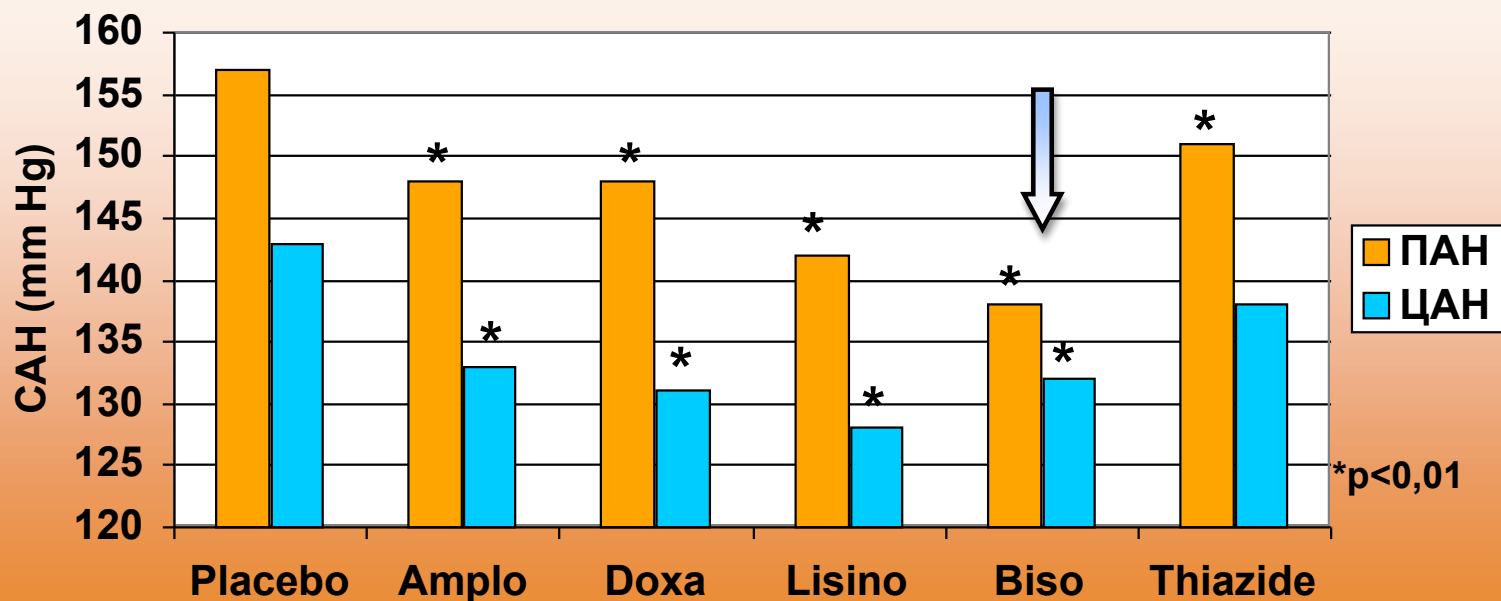


*P < 0.05 between treatment

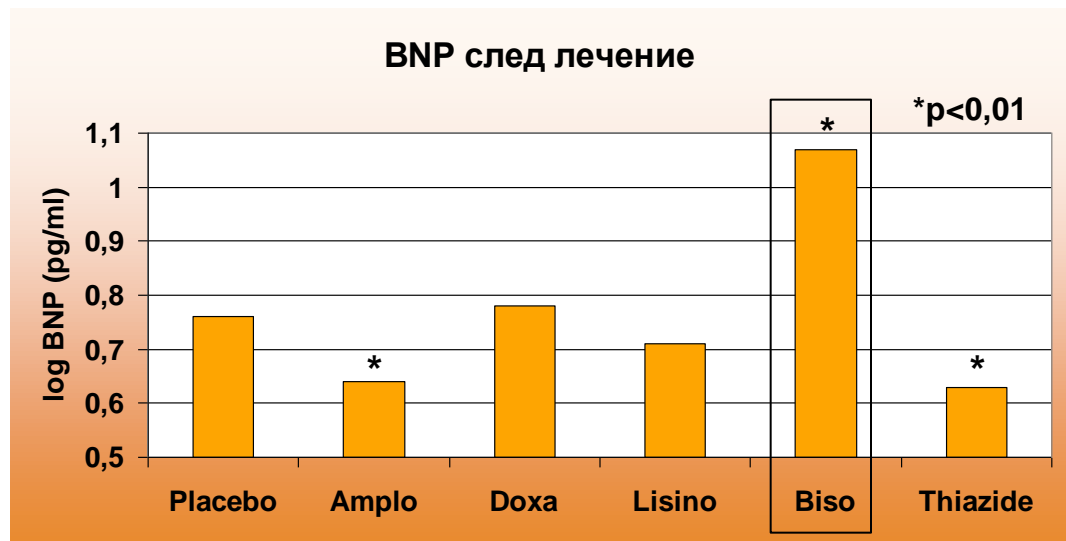
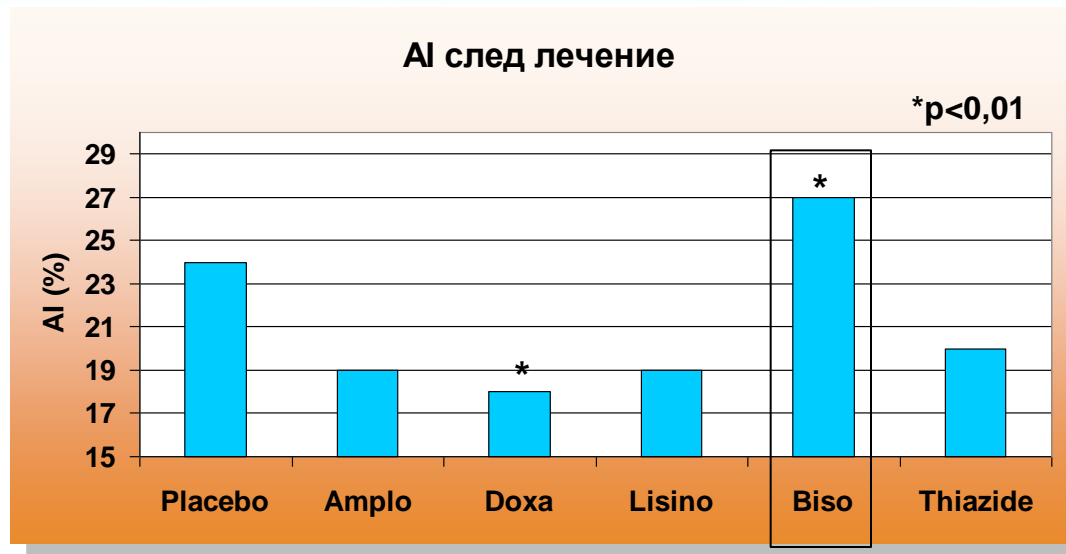
■ Aliskiren/HCTZ (n=27)
■ Amlodipine (n=25)

Липсва кореспондентност в ефекта на ББ върху периферно АН и централно АН

САН след 6 седм. лечение

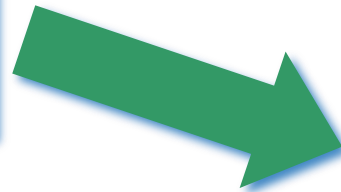


Диференциращ ефект на ББ върху AI и BNP

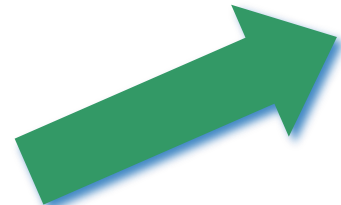


ББ (конвенц.) са по-малко ефективни за редуциране на ЦАН,
отколкото останалите АХ медикаменти въпреки сходния си
ефект върху периф. АН

Арт. ригидност ↑
(PWV)



Рефл. вълна ↑
(AI)



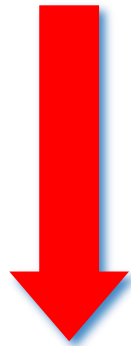
Централно
САН →/↑

ББ имат сходен ефект върху PWV, но повишават рефлекторната вълна

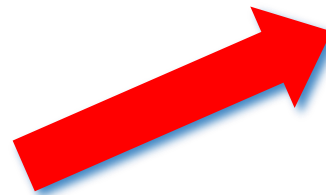
	Aortic pulse wave velocity	Augmentation index
ACE inhibitors	↓	↓↓
Angiotensin receptor blockers	↓	↓↓
β-Blockers	→ ↓↓	→ ↑
Calcium channel blockers	↓	↓↓
Thiazide diuretics	↔	↓
Nitrates	↔	↓↓↓
PD5 inhibitors	↓	↓

ББ повишават ЦАН поради увеличение на рефл. вълна

Бета-блокери

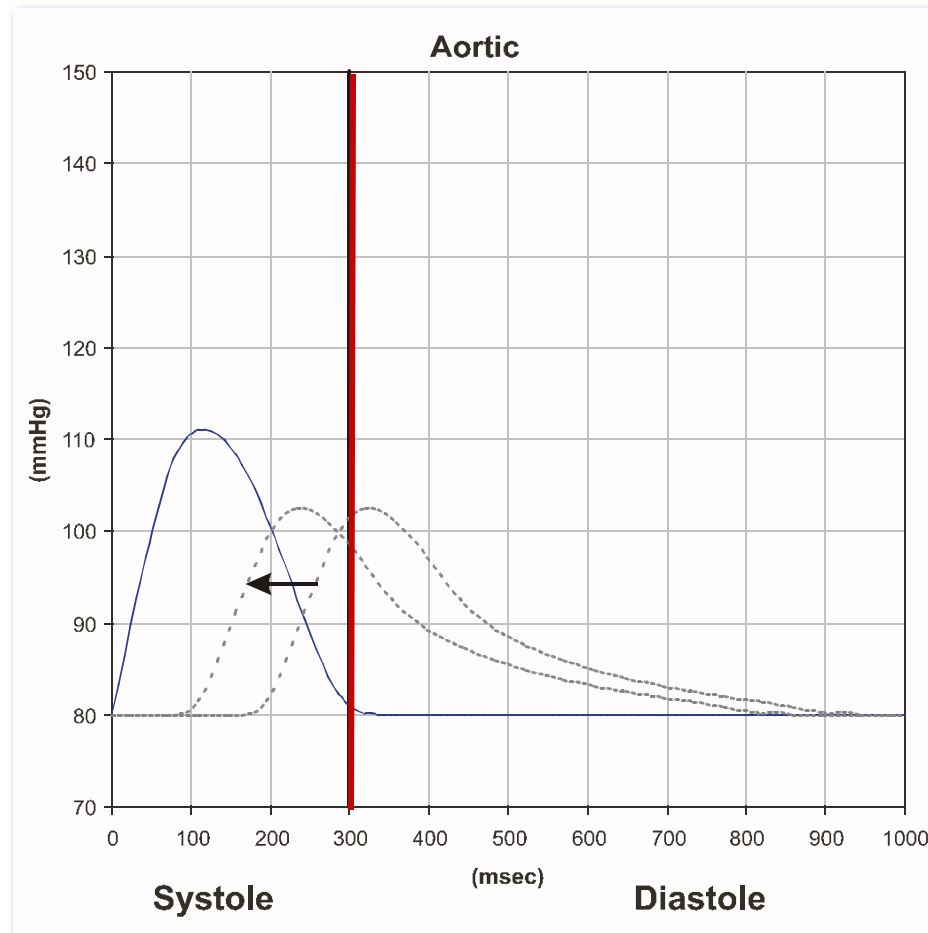


Рефл. вълна ↑
(AI)

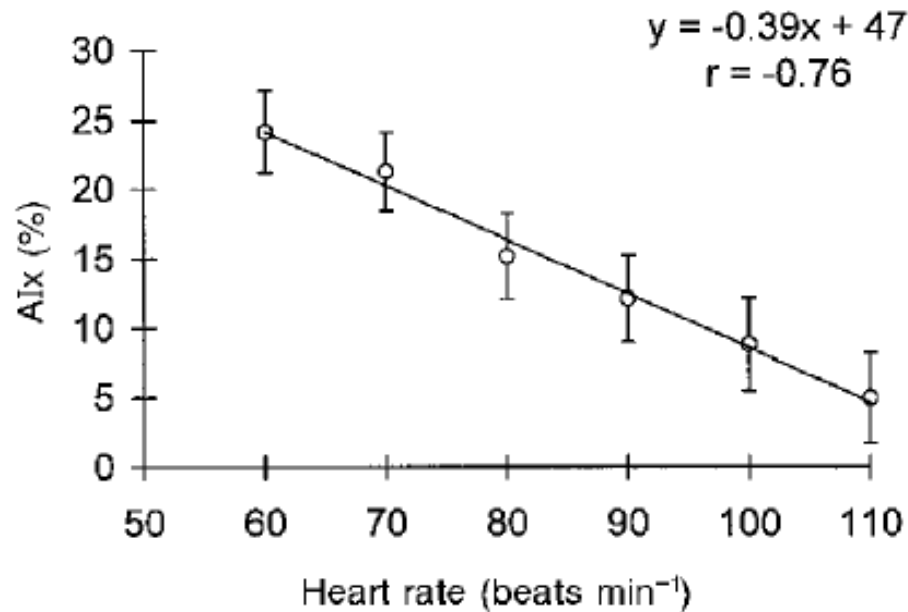


Централно
САН →/↑

Главният механизъм за увеличаване на рефл. вълна при ББ е забавянето на СЧ



Понижаването на СЧ резултира усилване на рефлекторната вълна и повишаване на централното АН



СЧ 10 уд./мин.↓



AI 4%↑



ЦАН 5 mmHg↑

Не всички ББ усилват рефлекторната вълна

Local Pulse Pressure and Regression of Arterial Wall Hypertrophy During Long-Term Antihypertensive Treatment

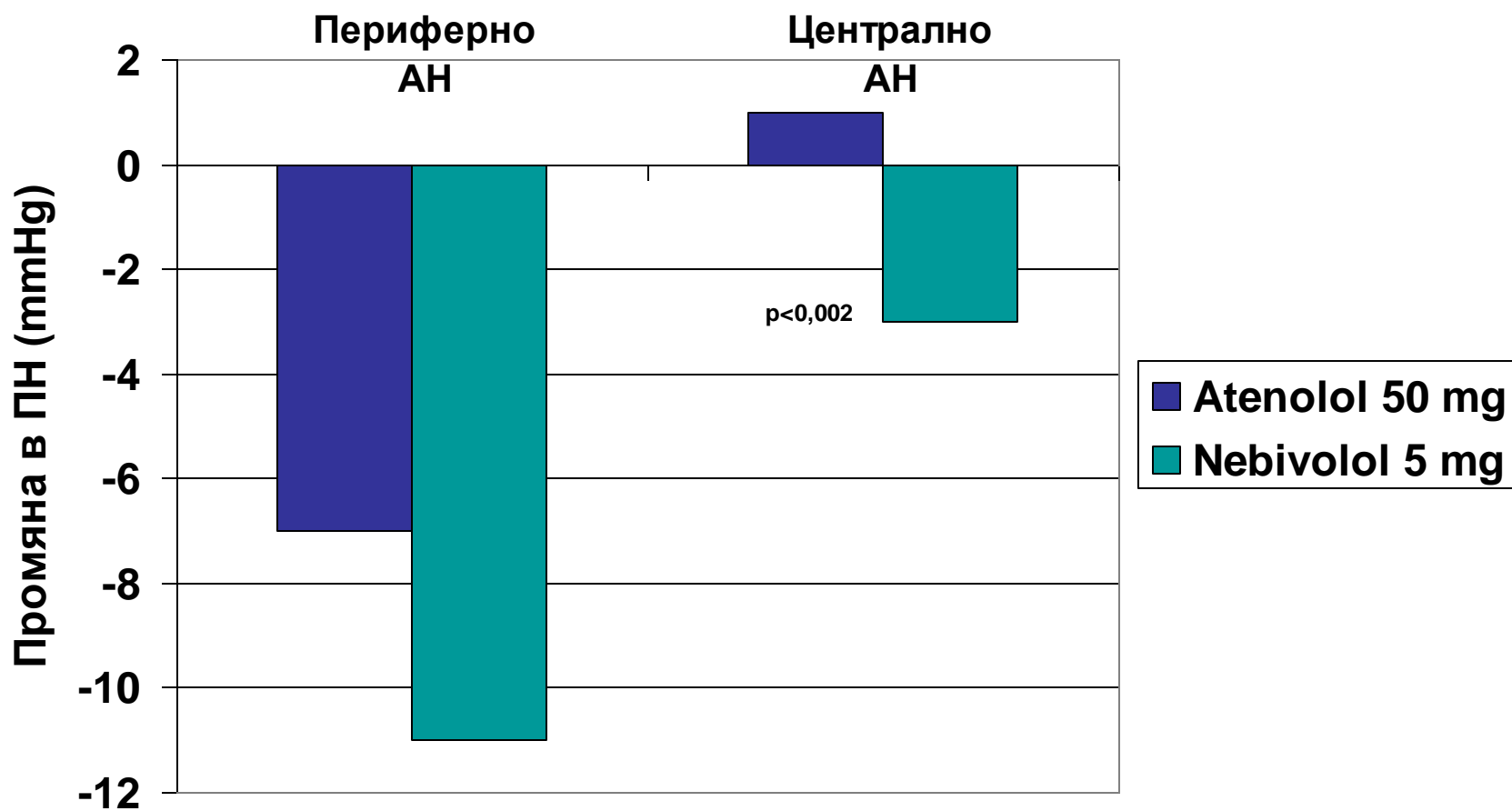
Pierre Boutouyrie, MD, PhD; Caroline Bussy, MD; Daniel Hayoz, MD; Jurg Hengstler, MD; Nathalie Dartois, MD; Brigitte Laloux, PhD; Hans Brunner, MD; Stéphane Laurent, MD, PhD

Background—Local pulse pressure (PP) is an independent determinant of carotid artery wall thickness, stronger than mean blood pressure (BP). The present study was designed to assess whether a β -adrenoceptor antagonist–based or an ACE inhibitor–based treatment was able to reduce carotid artery wall hypertrophy through a reduction in carotid PP rather than by lowering mean BP and whether the influence of local PP reduction could also be detected at the site of a muscular artery, the radial artery.

Methods and Results—Ninety-eight essential hypertensive patients were randomized to 9 months of double-blind treatment with either celiprolol or enalapril. Arterial parameters were determined with high-resolution echo-tracking systems. PP was measured locally with applanation tonometry and independently of mean BP. After 9 months of treatment, mean BP, carotid PP, and intimal-medial thickness (IMT) decreased significantly, with no difference between the 2 groups. The reduction in carotid PP but not in mean BP was a major independent determinant of the reduction in carotid IMT. Radial artery IMT and PP decreased significantly with both treatments. However, the reduction in radial artery IMT was not related to the changes in radial artery PP.

Conclusions—The regression of carotid artery wall hypertrophy during long-term antihypertensive treatment was dependent on the reduction in local PP rather than on the lowering of mean BP. The effect of PP lowering on IMT reduction was observed at the site of an elastic artery but not at the site of a muscular artery. (*Circulation*. 2000;101:2601-2606.)

Nebivolol подобрява централната ХД за разлика от atenolol



Не всички ББ усилват рефлекторната вълна

Вазодилатиращи
бета-блокери



Периферна
вазодилатация



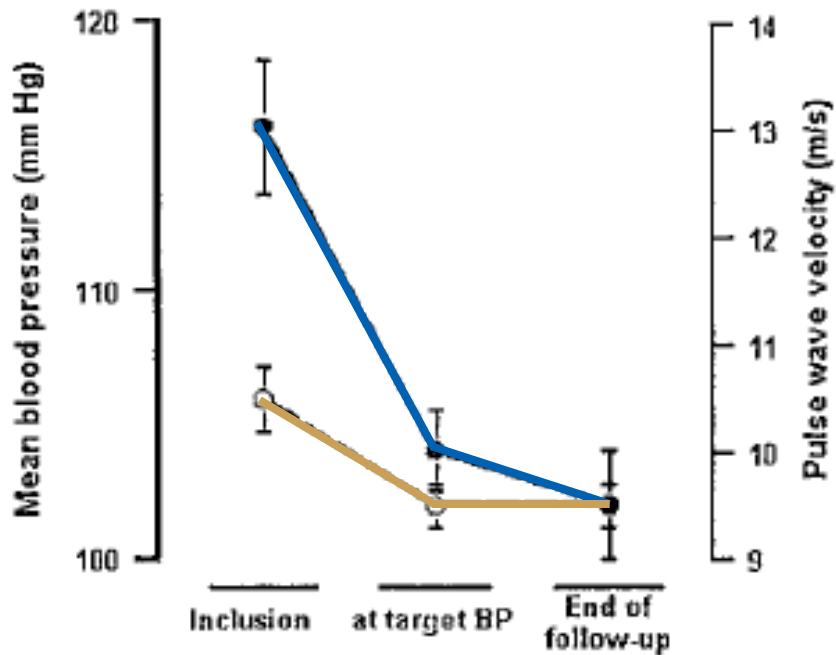
Рефл.
вълна = ↓



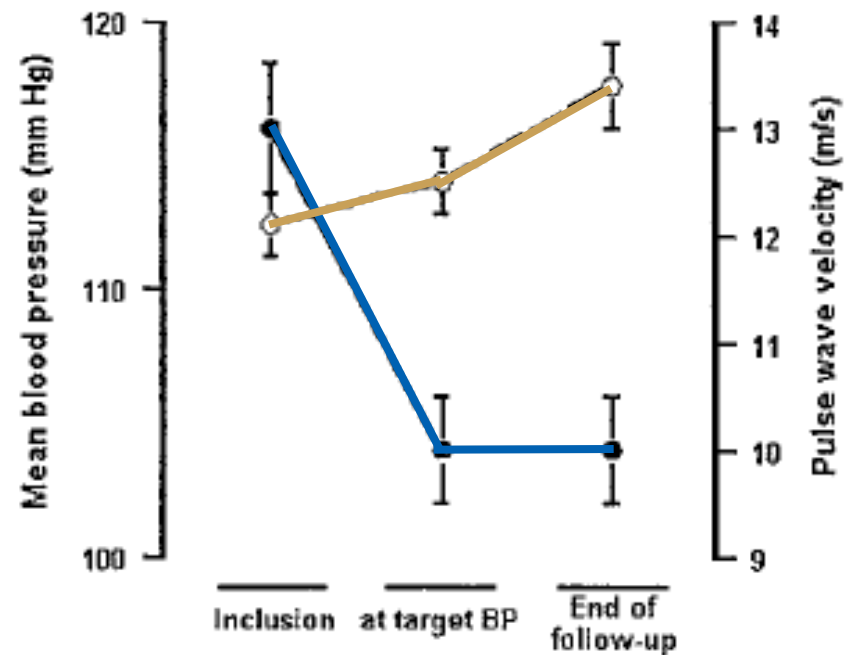
ЦАН = ↓

Фармакодинамика на артериалната ригидност

Въпреки сходното периф. АН, само преживелите имат редукция на PWV



Survivors



Non-survivors

Редукция на артериалната ригидност (PWV)

Зависима от редукцията на АН:

- АН↓ в еласт. артерии,
- редукция на рефл. вълна (AI) чрез дилатация на малките артерии

Независима от редукцията на АН:

- модификация на ГМК (<3 мес.),
- еластин/колаген (>3 мес.)

Механизъм на редуциране на артериалната ригидност при антихипертензивна терапия

- ACE инх. – независимо от АН↓
- АРБ – независимо от АН↓
- КА – независимо от АН↓
- ББ – независимо от АН↓
- Диуретици – зависимо от АН↓
- Алдостеронови антагонисти – независимо от АН↓

Заклучение:

- Артериалната ригидност и ЦАН са независими и по-силни предиктори на СС инциденти, отколкото периферното АН.
- Различните (класове) антихипертензивни медикаменти имат различен ефект върху ЦАН и периф. АН.
- ББ (без вазодилатиращи свойства!) са по-малко ефикасни от останалите АХ медикаменти в понижение на централното АН.
- Спешна нужда от разкриване дали една терапевтична стратегия, целяща нормализиране на арт. ригидност и централно АН е по-ефективна в превантиране на СС събития в сравнение с обичайната, насочена към периферното АН.