

## Background and Objective

- Patients with type 2 diabetes have a high risk of cardiovascular diseases<sup>1</sup>.
- Arterial stiffness gradient is a new prognostic predictor of mortality previously assessed only in dialysis population<sup>1-2</sup>.
- **The aim of the study** was to assess arterial stiffness and stiffness gradient in diabetic patients with arterial hypertension (AH).<sup>2-3</sup>

1-Chang L.H. et al. Intern Med 2014;53:2425-2431  
2-Agnoletti D. et al. J Hum Hypertens 2016; doi: 10.1038/jhh.2016.58  
3-Cardoso C.R. et al. Diabetes Care 2013;36:3772-8

## Material and methods

### Inclusion criteria

- Patients with mild and moderate AH receiving combined antihypertensive therapy
  - Target BP <140/85 mmHg was achieved in 52,7% of patients..
- Type 2 DM, hospitalization for mild diabetic ketoacidosis
  - Antidiabetic treatment: oral glucose-lowering drugs in 13%, insulin in 87%
- Statins in 7.27% of patient

### Exclusion criteria

- Atrial fibrillation,
- Previous stroke or myocardial infarction
- Chronic heart failure class II-IV (NYHA)
- Clinical symptoms of peripheral arterial disease

### Methods

BP was measured with a validated oscillometric device

**Measurement of arterial stiffness** : Sphygmocor (AtCor, Australia):

- ✓ Assessment of central pulse pressure (PP)
- ✓ Assessment of carotid- femoral PWV (PWVc-f) and carotid- radial PWV (PWVc-r)
- ✓ Calculation of stiffness gradient : PWVc-f/PWVc-r

### Criteria for arterial stiffness increase

- ✓ **Arterial stiffness**
  - ✓ Pulse pressure >60 mmHg, PWVc-f >10 m/s
  - ✓ CAVI >9,0
- ✓ **Loss of stiffness gradient**: PWVc-f/PWVc-r >1,0

### Study population (n=55)

Parameter	Value
Male/female, n (%)	19 (38)/36 (62)
Age, years	61.6±12.7
BMI, kg/m <sup>2</sup>	28.9±5.6
Smoking, n (%)	16 (29)
Dyslipidemia, n (%)	55 (100)
Duration of diabetes, years (Me, min,max)	7.6 (0.5;10)
SBP/DBP brachial, mmHg	142.5±25.5/82.7±10.7
SBP/DBP aortic, mmHg	126.7±11.2/80.0±8.9
HbA <sub>1c</sub> , %	9.0±2.0
Urine Albumin/Creatinine, mg/g (Me, min,max)	16.6 (1.8)

### Statistical analysis

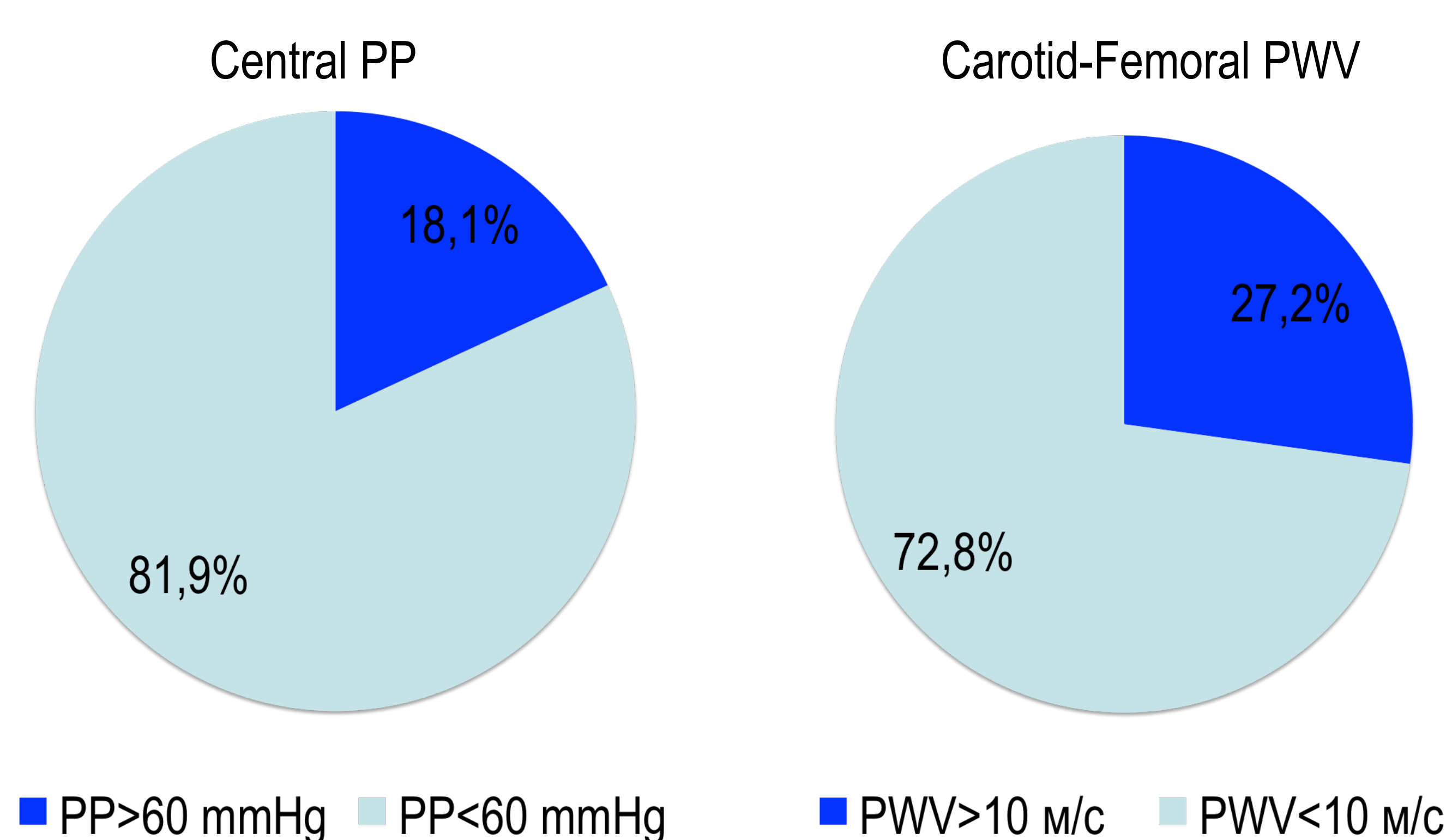
- ✓ Data are presented as M±SD. p<0.05 was considered significant

## Results

Arterial stiffness characteristics in the study group (**table 2**):

1. PP >60 mmHg was observed in 18,1% (**fig.1**). Group with PP>60 mmHg was characterized by higher HbA<sub>1c</sub> (9.8±1.8 vs 8.4±2.0%) and stiffness gradient (1.4±0.4 vs 1.2±0.1); p<0.05 for trend
2. Mean CR-PWV was 7.7±1.2 m/s, mean CF-PWV was 10.3±2.0 m/s. CF-PWV>10m/s was observed in 27.2% of patients (**fig.1**). Groups with PWV above and below 10m/s were similar by age, gender, metabolic risk factors and haemodynamic parameters (**table 3**).
3. Mean stiffness gradient was 1.3±0.4, gradient ≥1 was observed in 92,7%. Patients with high stiffness gradient were older (63.3±11.6vs54.0±10.2,p<0.05). All other parameters were similar (**table 4**).

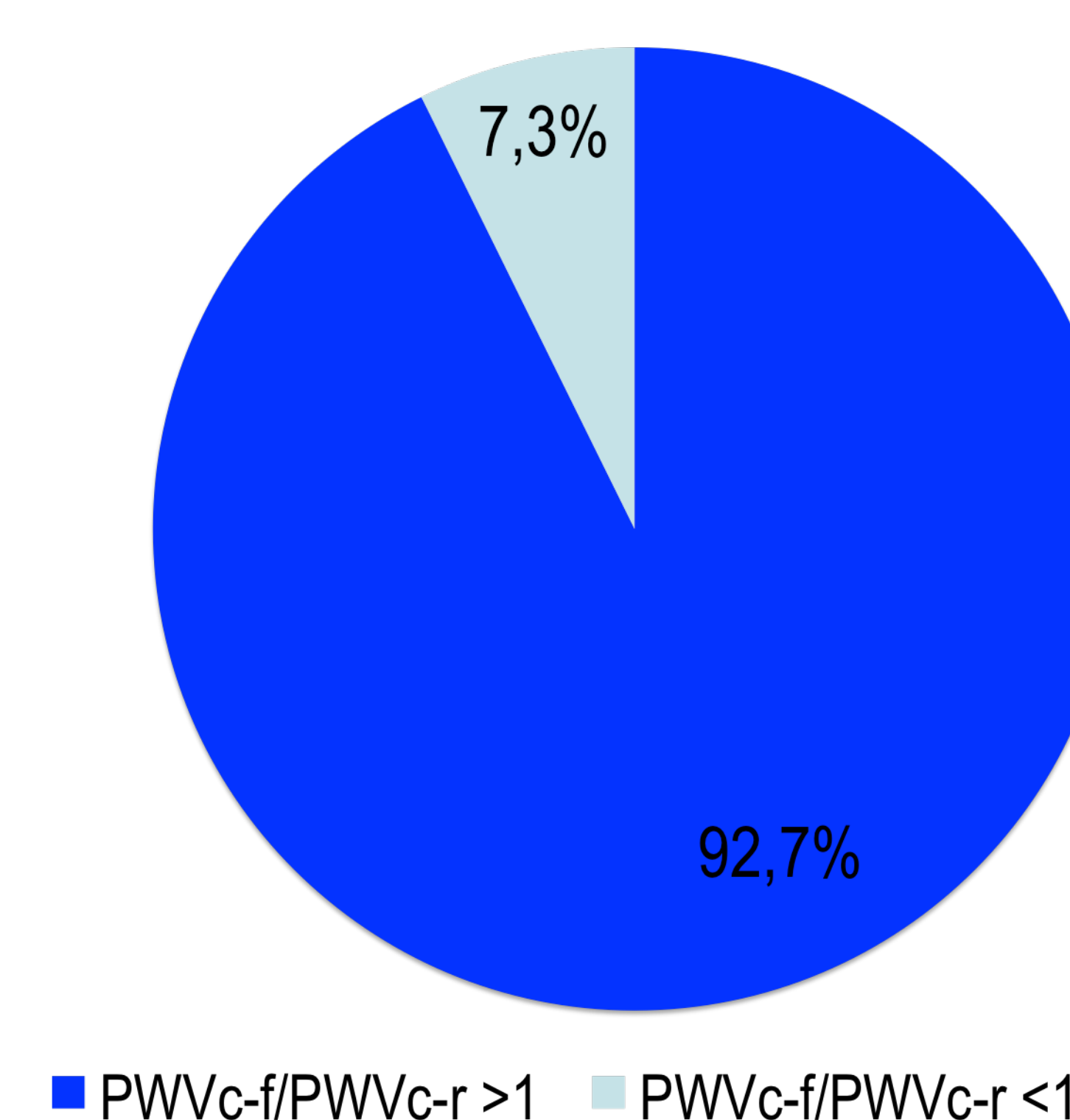
**Figure 1. Characteristics of arterial stiffness in study group**



**Table 2. Parameters of arterial stiffness (n=55)**

Parameter	Value
PWVc-f, m/s	10,3±2,0
PPao, mmHg	61,0±14,3
PWVc-r, m/s	7,7±1,2
PWVc-f/PWVc-r	1,3±0,4

**Figure 2. Loss of stiffness gradient in the study group**



**Table 3. Characteristic of patients according to PWVc-f**

Parameter	PWV >10	PWV <10
Male/female, n (%)	10 (34,4)/19 (65,5)	10 (38)/16 (61,5)
Age, years	65,7±9,4	61,3±12,9
BMI, kg/m <sup>2</sup>	29,2± 5,2	28,5± 5,6
SBP/DBP brachial, mmHg	146±28,9/87±11,1	140± 2,0/83± 10,3
Cf/Cr	1,4±0,3	1,06±0,8
Cholesterol, mmol/l	5,4±2,02	5,2±1,7

**Table 4. Characteristic of patients according to the stiffness gradient**

Parameter	Cf/Cr <1	Cf/Cr >1
Male/female,n (%)	4 (40)/6 (60)	17 (37,7)/28 (62,2)
Age, years	52,1±7	64,4±10,4*
BMI, kg/m <sup>2</sup>	27,5±4,7	29,0± 5,5
SBP/DBP brachial, mmHg	135,7±17/86±5,6	143,4±25,5/84,6±11,2
Cholesterol, mmol/l	5,9±2,2	5,2±1,7

\* p±0,05 compared to Cf/Cr <1

## Conclusions

Patients with arterial hypertension and type 2 diabetes mellitus are characterized by aortic-brachial stiffness mismatch. Thus it can be used as early marker of vascular ageing in this patients' population.