Right ventricular-pulmonary arterial coupling in patients on chronic haemodialysis with pulmonary hypertension determines patients with most advanced structural heart changes

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Negative consequences of chronic hemodialysis

- **Low-resistance arteriovenous access as an access for hemodialysis**
- **Cyclic hyperhydration**
- **Endocrine-metabolic changes etc.**

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- **More frequent cardiovascular diseases** →
- **Anaemia**
- **Cachectization, etc.**

- **Dyspnoea**
- **Fatigue**
- **Weakness etc.**

Malik J, The Journal of Vascular Access 202
Ahmadmehrabi S, Seminars in dialysis, 201

CZecking heart failure in patients with advanced chronic kidney disease (Czecking HF-CKD) trial

- **Cohort, observational, longitudinal study**
- **A group of haemodialysis patients from 6 cooperating haemodialysis centres**

- **Cross-sectional analysis of patients‘ inclusion visits**

Malik J, J Vasc Access, 2022

The aims of the analysis

1. **To analyze the relations between pulmonary hypertension (PH) and right ventricular-pulmonary arterial (RV-PA) coupling with arteriovenous access flow (Qa) and current hydration**
2. **To analyze structural heart changes associated with RV-PA uncoupling**
3. **To reveal the prevalence, aetiology and severity of PH in the Czech haemodialysis population.**

Methods

- **Echocardiography with non-invasive assessment of haemodynamics**
- **Arteriovenous access flow measurement**
- **Bioimpedance analysis**
- **Basic laboratory tests**

- **All examinations were performed during one visit >24 hours after the previous haemodialysis**

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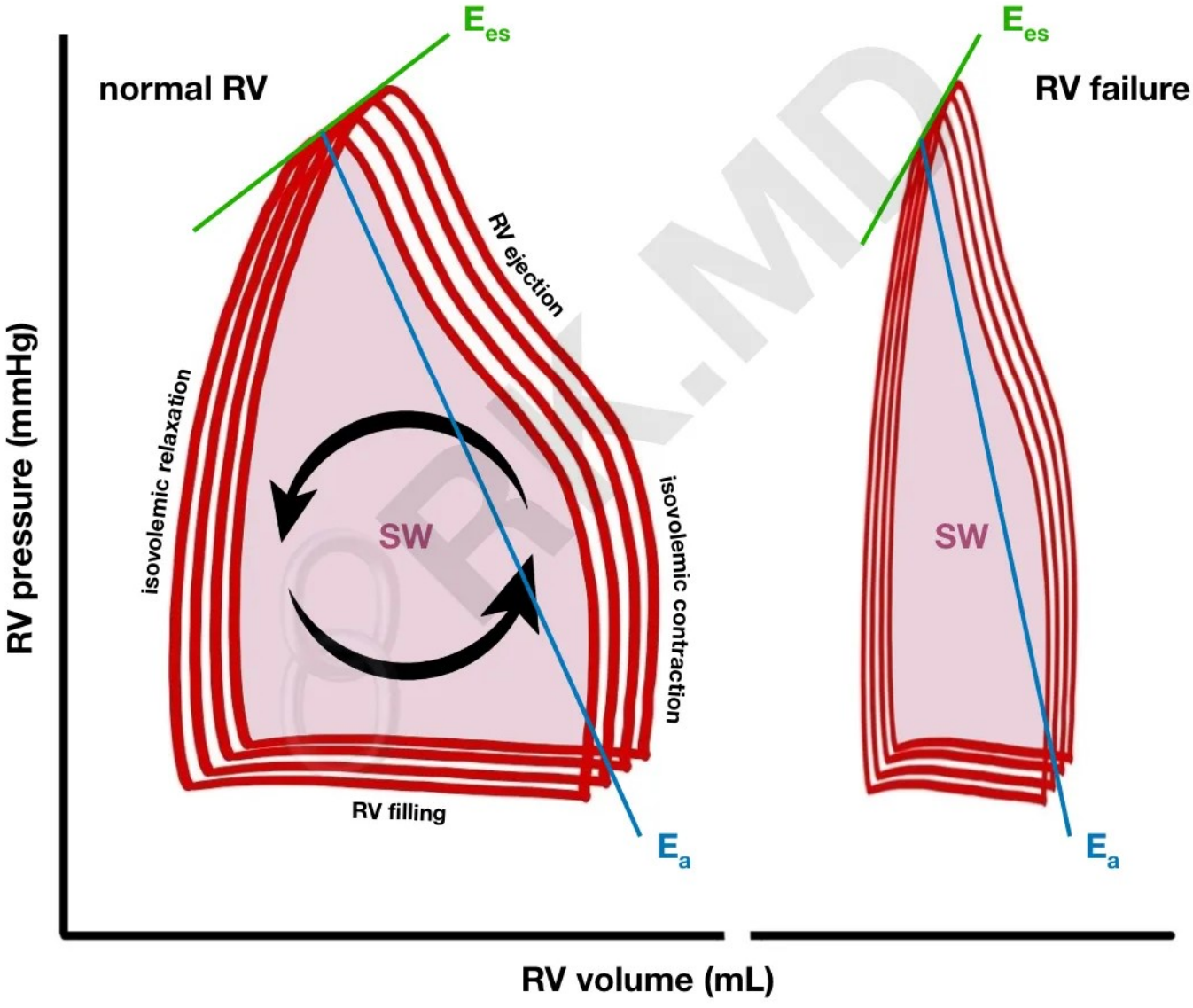
Definition of PH in our analysis

- **Echocardiographically estimated pulmonary arterial systolic pressure (PASP) above 35 mmHg**
- **PASP= peak regurgitation gradient on the tricuspid valve + central venous pressure**
- **Indirect signs of PH: presence of right ventricular hypertrophy, left ventricular D-shape or dilatation of the truncus pulmonalis**

  - **PH classification: Mild (PASP 36-45 mmHg), Medium (PASP 46-60 mmHg) and Severe (PASP > 60 mmHg)**

RV-PA COUPLING



Definition of RV-PA uncoupling in our analysis

- **TAPSE/PASP ratio as a surrogate of RV-PA coupling**
- **Cut-off value 0.36 as suggested by the recent metanalysis of Anastasiou et al.**

  - **RV-PA coupling was analyzed only in patients with PH**

Characteristics of the studied population

- **Data of 336 patients were analyzed**
- **Age 69,5 (QR 19,6) years**
- **92% of patients with arteriovenous dialysis access, 8% with dialysis catheter**
- **Duration of haemodialysis treatment 24 (QR 61) months**
- **The most common causes of CKD: diabetes mellitus (31%), arterial hypertension (23%) and polycystic kidney disease (7%)**

Results…

Relation between PH and dialysis access flow and hydration status

	NO PH	PH	P-value
ialysis access flow ml/min)	935 (700)	1000 (890)	0.584
entral venous pressure mmHg)	4 (4)	9 (10)	<0.0001
verhydration to xtracellular water ratio	0.05 (0.13)	0.1 (0.15)	0.003

Relation between RV-PA coupling and dialysis access flow and hydration status

	RV-PA coupling	RV-PA uncoupling	P-value
ialysis access flow ml/min)	1020 (900)	765 (1050)	0.235
entral venous pressure mmHg)	8 (8)	18 (5)	<0.0001
verhydration to xtracellular water ratio	0.07 (0.16)	0.15 (0.2)	0.006

Structural heart changes in RV-PA uncoupling

	RV-PA coupling	RV-PA uncoupling	P-value
VEDVi (mL/m^2)	56.14 (23.1)	76.33 (43.32)	0.009
VEF (%)	59 (13)	42 (20.5)	0.001
DA (mm^2)	20 (7.65)	27.5 (9)	0.002
SA (mm^2)	11.55 (5)	19.5 (13)	0.001
AC (%)	45.3 ± 11.1	33.4 ± 13.2	0.001

VEDVi- end-diastolic left ventricular volume indexed to BSA, EF LV- ejection fraction of the left ventricle, EDA- end-iastolic area of the right ventricle, ESA- end-systolic area of the right ventricle, FAC- fractional area

Haemodynamic consequences of RV-PA uncouplig

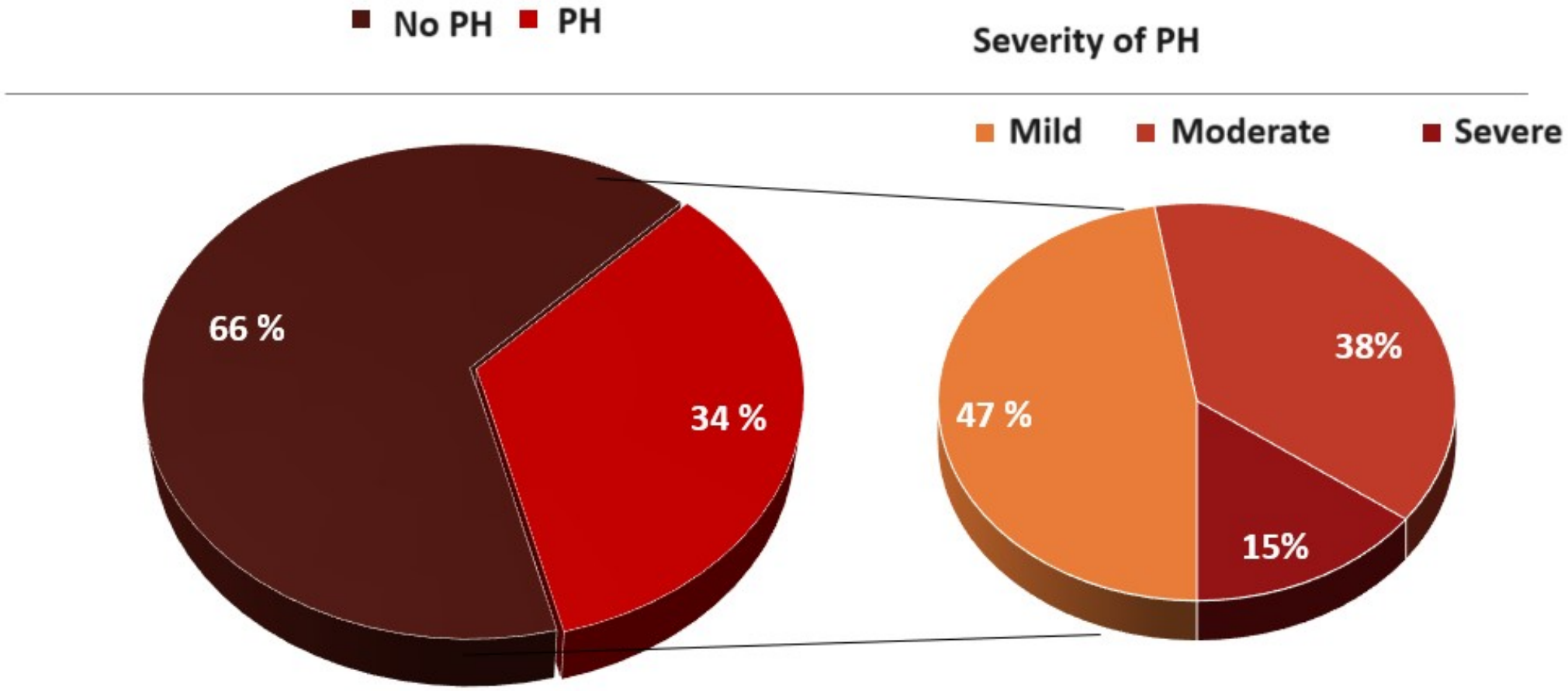
	RV-PA coupling	RV-PA uncoupling	P-value
CO (L/min)	5.78 (2.43)	4.21 (2.56)	0.001
COef (L/min)	4.60 (2.16)	3.44 (1.67)	0.0003
LVEF (%)	59 (13)	42 (20.5)	0.001

Heart failure in PH and RV-PA uncoupling

	NO PH	PH
Heart failure (%)	37,5	79

	RV-PA coupling	RV-PA uncoupling
Heart failure (%)	52	88

PREVALENCE OF PH IN THE STUDIED POPULATION



- one quarter of patients suffered from RV-PA uncoupling

Conclusions

- **The relation between dialysis access flow and the diagnosis of PH or RV-PA uncoupling is weak, but the relation of these two variables to fluid overload is stronger.**
- **RV-PA uncoupling is associated with more advanced structural heart changes in patients with PH.**
- **PH is present in about one-third of Czech haemodialysis population and among them, one quarter of patients suffered from RV-PA uncoupling. HF was the strongest contributor of PH in haemodialysis population.**

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Thank you for your attention!