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Stress Pulmonary Circulation Parameters in Patients After a Heart Transplant and Cancer Survivors: A Cardiovascular Magnetic Resonance Study

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Pulmonary circulation parameters

- Several versions, different modalities – CT, nuclear methods…
  - latest method – Cardiovascular Magnetic Resonance (CMR)

- Time needed for blood to get through the pulmonary circulation
  - CMR - RV -> LV
- Reflect the function of the cardiopulmonary system
  - Systolic function of both ventricles, diastolic of LV, pulmonary hypertension

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Advantages of CMR

- No additional sequences (post-processing of perfusion scans)
  - Potential for retrospective studies

- **Stress parameters**
  - During the continuos infusion of **Adenosine** (140 mcg/kg/min)
  - only 1 publication so far; PTT_S higher than rest
    - Only patients with HCM

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Pulmonary circulation parameters

- Pulmonary transit time (**PTT**)
  - = time needed for the contrast agent to get from RV to LV
- Pulmonary transit beats (**PTB**)
  - = number of cardiac cycles
- **Stress** parameters (**PTT_S**)
  - PTT during Adenosine infusion

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Patient selection

- Patient after heart transplant (HTx)
  - 48, no systolic dysfunction, no PH
  - 2 subgroups – 41 without diastolic dysfunction (HTx_A) and 7 with (HTx_B)
- Childhood cancer survivors (CCS)
  - After potentionally cardiotoxic chemotherapy in young age
  - 39, no systolic, diastolic dysfunction or PH
  - Anthracyclines (74%), cisplatin, carboplatin

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Inclusion/exclusion criteria

Inclusion criteria		Exclusion criteria	
HTx	**CCS**	**HTx**	**CCS**
1 year ± 30 days after HTx	Adults after cardiotoxic chemotherapy in childhood	sPAP > 40 mmHg	sPAP > 40 mmHg
Stress CMR perfusion available	Stress CMR perfusion available	–	Any signs of systolic or diastolic impairment
Echocardiographic examination including E/E', E/A measurement and pulmonary systolic artery pressure assessment	Echocardiographic examination including E/E', E/A measurement and pulmonary systolic artery pressure assessment		-
≤ 30 days between CMR and echocardiography	≤ 30 days between CMR and echocardiography		

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Patient selection

- - 58% pts. after HTx showed diastolic dysfunction only detectable in stress conditions [1)]

- -> patients after HTx withouth signs of diastolic dysfunction
  -> higher pulmonary circulation parameters

1) Meluzin J, Hude P, Leinveber P, Krejci J, Spinarova L, Bedanova H, et al. High prevalence of exercise-induced heart failure with normal ejection fraction in post-heart transplant patients. Biomedical Papers. 2014 Jun 23;158(2):295–302.

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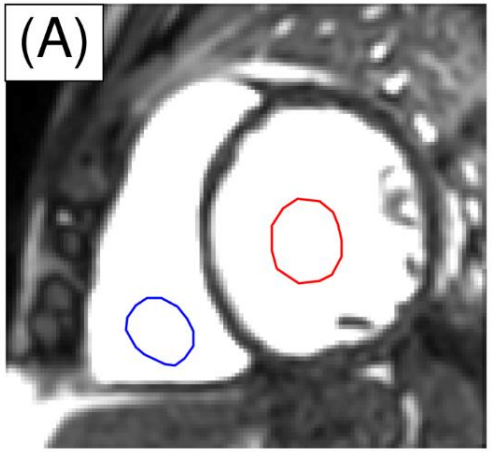
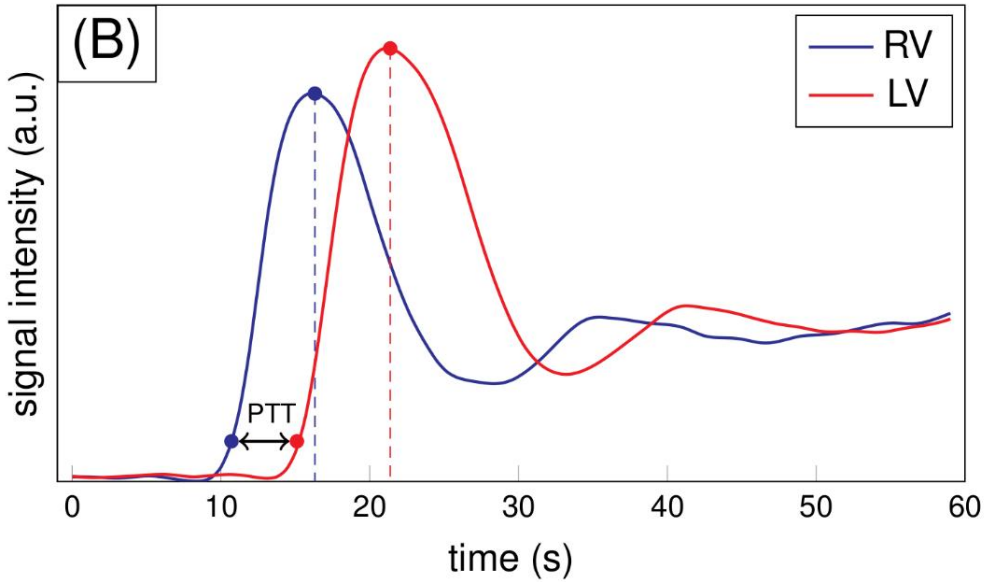
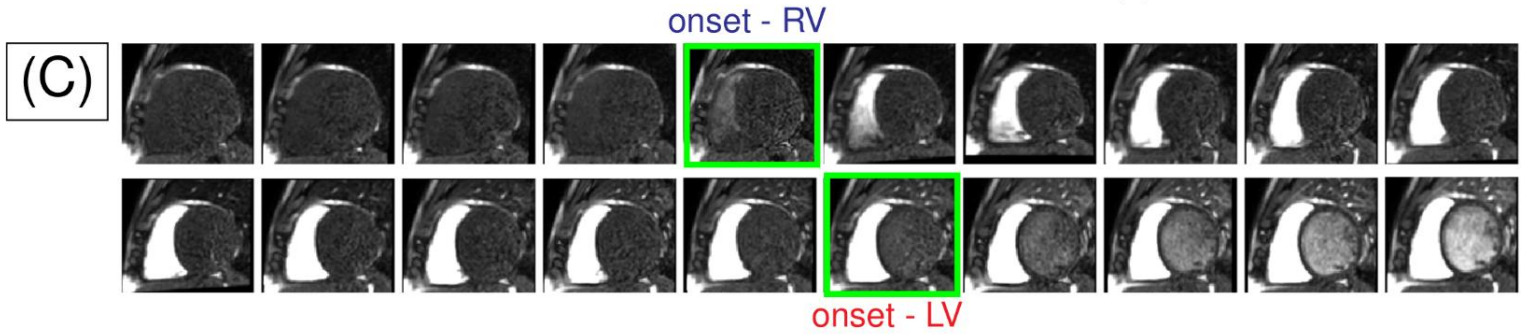
Methods

- Short-axis perfusion
- Rest + Stress; PTT, PTB







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Methods – HR correction

- HR affects PTT

- Different „methods“ of correction
  - Some authors just use PTB

- Bazzet formula

$$PTTc\ (s) = \frac{PTT\ (s)}{\sqrt{RR\ interval}}$$

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Results - Rest parameters

- **PTT -** no significant difference between CCS and HTx subgroups
- PTTc was **significantly prolonged** in HTx subgroups
- PTB was **significantly higher** in HTx subgroups

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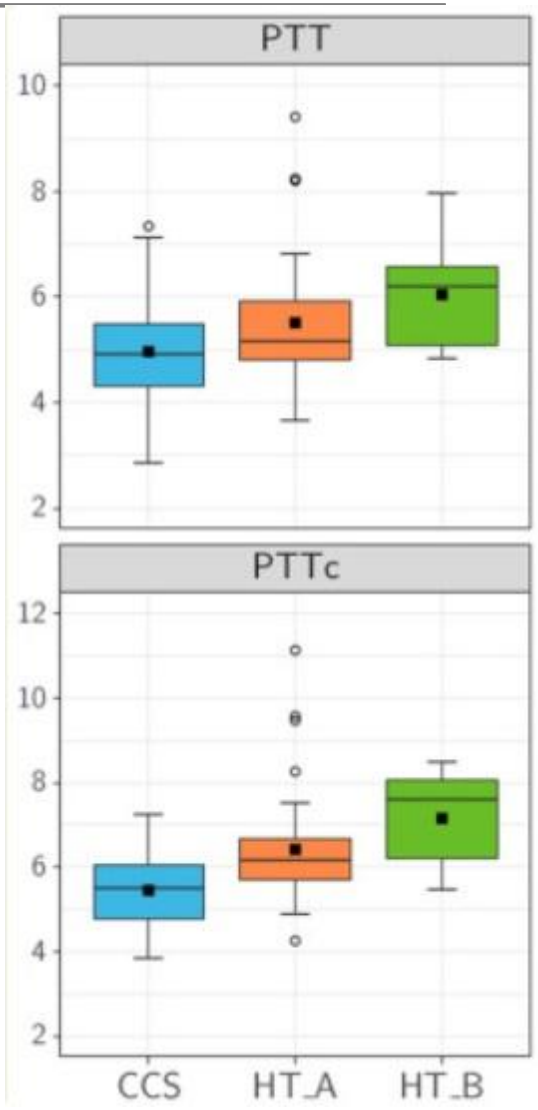
Results - Rest parameters

	CCS	HTx_A	HTx_B	p (CCS vs. HTx_A)	p (CCS vs. HTx_B)	p (HT_A vs. HTx_B)
PTT (s)	4.96 ± 0.93	5.51 ± 1.14	6.04 ± 1.13	0.063	0.13	0.61
PTTc (s)	5.45 ± 0.87	6.41 ± 1.3	7.15 ± 1.2	**< 0.001**	**0.015**	0.44
PTB	5.82 ± 0.91	7.22 ± 1.62	8.43 ± 1.51	**<0.001**	**<0.001**	0.38



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Results - Stress parameters

- PTT_S was **significantly prolonged** in HTx subgroups

- PTTc_S was **significantly prolonged** in HTx subgroups

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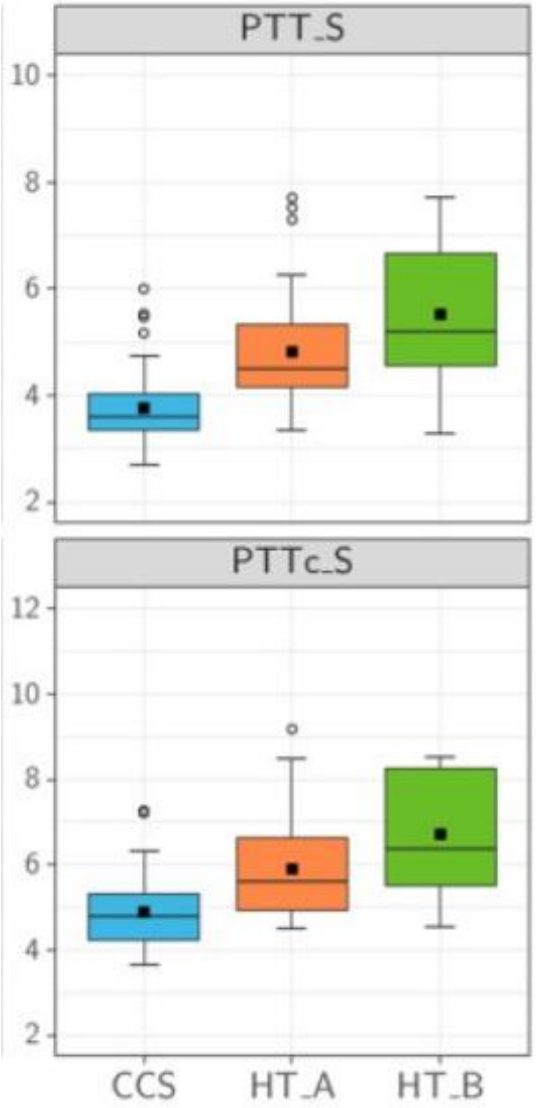
Results - Stress parameters

	CCS	HTx_A	HTx_B	p (CCS vs. HTx_A)	p (CCS vs. HTx_B)	p (HT_A vs. HTx_B)
PTT_S (s)	3.76 ± 0.78	4.82 ± 1.03	5.52 ± 1.56	**<0.001**	**0.003**	0.37
PTTc_S (s)	4.89 ± 0.89	5.9 ± 1.14	6.71 ± 1.63	**< 0.001**	**0.006**	0.33



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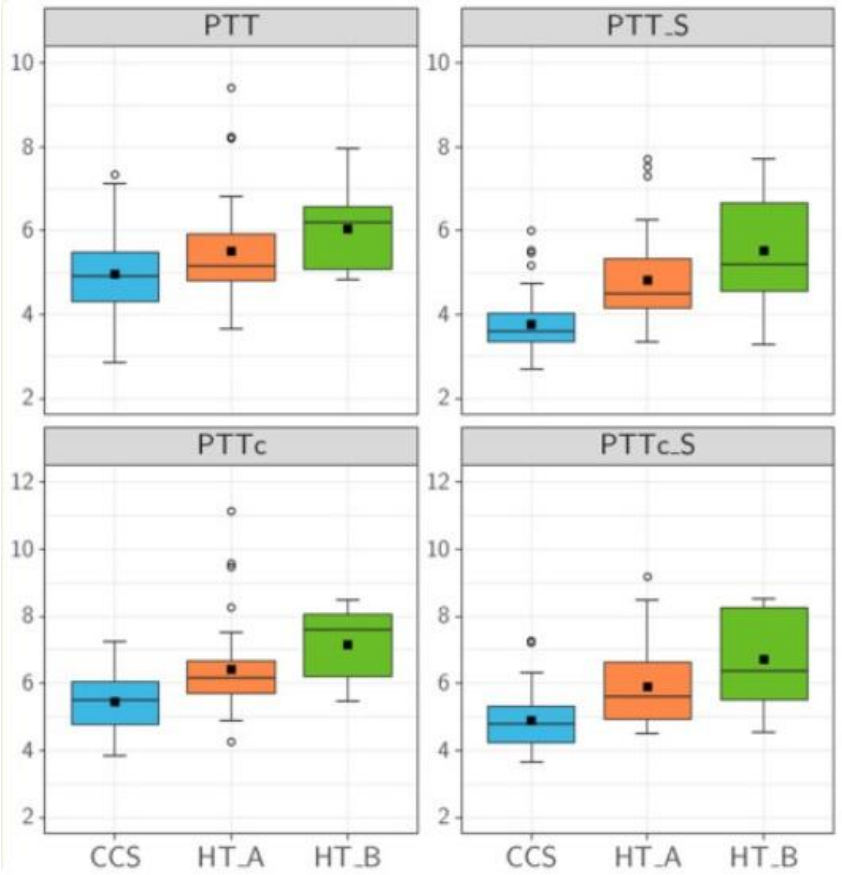
Results

- All stress and rest PTTc, PTB, were prolonged in HTx compared to CCS
  -> subtle diastolic dysfunction

- Stress parameters lower than rest
  - In contrary to only published data

- Expected higher parameters HTx_B
  - Trends but **not statistically signifficant**



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Study limitations

- Single center, restrospective study
- CCS – not a proper control healthy group
- Low number of patients in HTx_B subgroup

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Conclusion

- Assessing feasible
- Patients with subtle DD tends to have longer PTT and higher PTB
- Changes more prominent in stress

- Possible new stress test option

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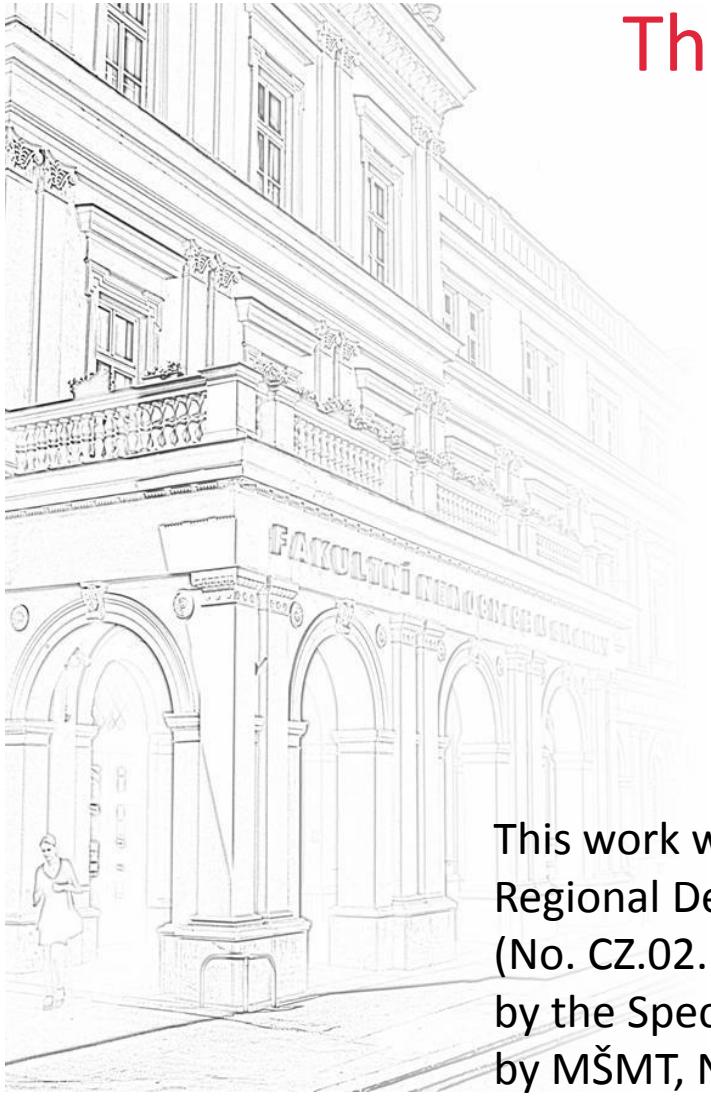

Thank you for your attention!

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This work was supported by the European Regional Development Fund - Project ENOCH (No. CZ.02.1.01/0.0/0.0/16_019/0000868) and by the Specific University Research provided by MŠMT, No.: MUNI/A/1462/2021