

Strategie redukce radiační dávky
v nukleární kardiologii
(EACVI report 2017)

Milan Kamínek
KNM LF a FN Olomouc



Strategies for radiation dose reduction in nuclear cardiology and cardiac computed tomography imaging: a report from the European Association of Cardiovascular Imaging (EACVI), the Cardiovascular Committee of European Association of Nuclear Medicine (EANM), and the European Society of Cardiovascular Radiology (ESCR)

Alessia Gimelli^{1*}, Stephan Achenbach², Ronny R. Buechel³, Thor Edvardsen⁴, Marco Francone⁵, Oliver Gaemperli³, Marcus Hacker⁶, Fabien Hyafil⁷, Philipp A. Kaufmann³, Patrizio Lancellotti^{8,9}, Koen Nieman¹⁰, Gianluca Pontone^{11,12}, Francesca Pugliese¹³, Hein J. Verberne¹⁴, Matthias Gutberlet¹⁵, Jeroen J. Bax¹⁶, and Danilo Neglia¹

Redukce radiační dávky

- Volba radiofarmaka
- Aplikovaná aktivita radiofarmaka
- Zobrazovací protokol
- Moderní kamera a rekonstrukční programy

Redukce radiační dávky

- **Volba radiofarmaka** - preference ^{99m}Tc -radiofarmak
 - ^{99m}Tc -tetrofosmin (stress and rest): 0.0058 and 0.0063 mSv/MBq, respectively
 - ^{99m}Tc -sestamibi (stress and rest): 0.0066 and 0.0070 mSv/MBq, respectively
 - ^{201}Tl -chloride (redistribution): 0.102 mSv/MBq.
- Zobrazovací protokol
- Moderní kamera a rekonstrukční programy

Redukce radiační dávky

- Volba radiofarmaka
- **Nízká aplikovaná aktivita radiofarmaka**
 - **^{99m}Tc -MIBI stress 148 MBq.....0.85 mSv**
 - **^{99m}Tc -MIBI stress 148/rest 444 MBq.....3.64 mSv**
 - **Aplikace podle váhy (BMI) !**
- Zobrazovací protokol
- Moderní kamera a rekonstrukční programy

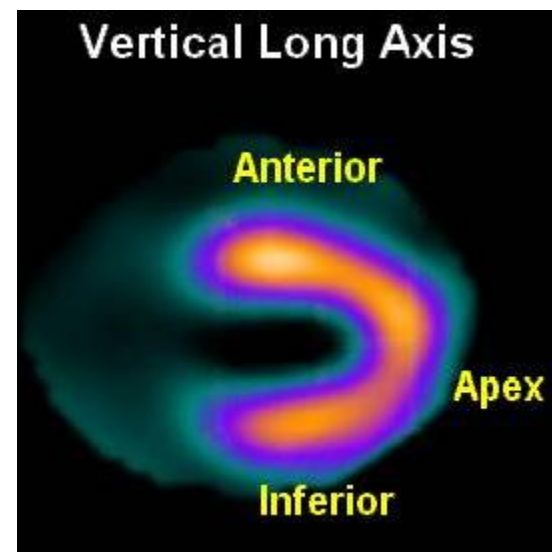
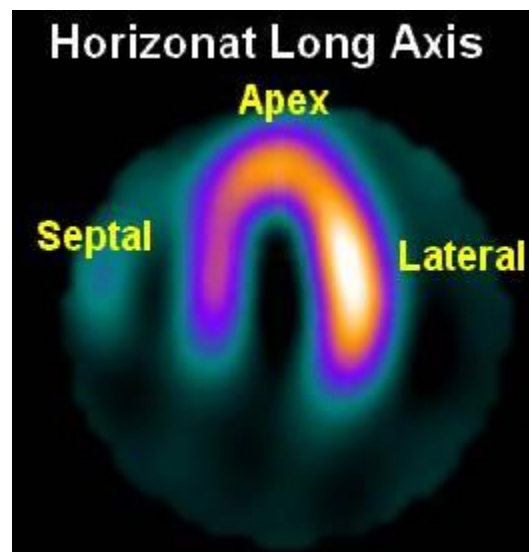
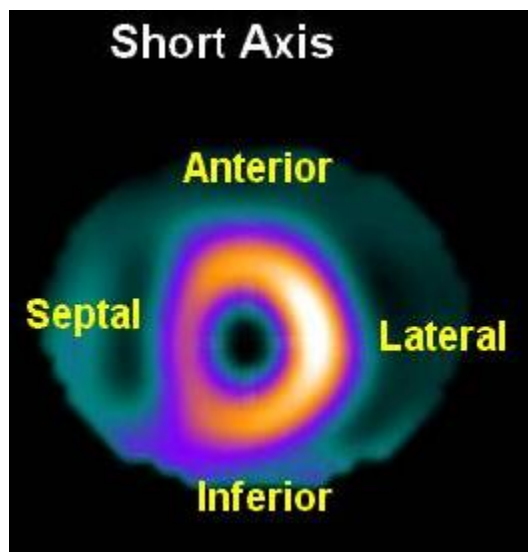
Redukce radiační dávky

- Volba radiofarmaka
- **Nízká aplikovaná aktivita radiofarmaka**
 - ^{99m}Tc -MIBI stress 148 MBq.....0.85 mSv
 - ^{99m}Tc -MIBI stress 148/rest 444 MBq.....3.64 mSv
 - ^{201}Tl 35 MBq stress-rest**3.57 mSv**

Kincl V, Kamínek M et al. Int J Cardiovasc Imaging 2016
Feasibility of ultra low-dose thallium stress-redistribution protocol including prone imaging in obese patients using CZT camera

Redukce radiační dávky

- Volba radiofarmaka
- Nízká aplikovaná aktivita radiofarmaka
- **Zobrazovací protokol (1-denní, 2-denní)**
- **neprovádět: dual-izotopový protokol**
- **preference: stress first/stress only (> 50 % pac.)**
- Moderní kamera a rekonstrukční programy



**Normální perfuze a funkce levé komory po zátěži:
nízké riziko závažné kardiální příhody**

Gibson PB, JACC 2002: 0,6% ročně

Kamínek M, BiomedPapers 2015: 0,7% ročně

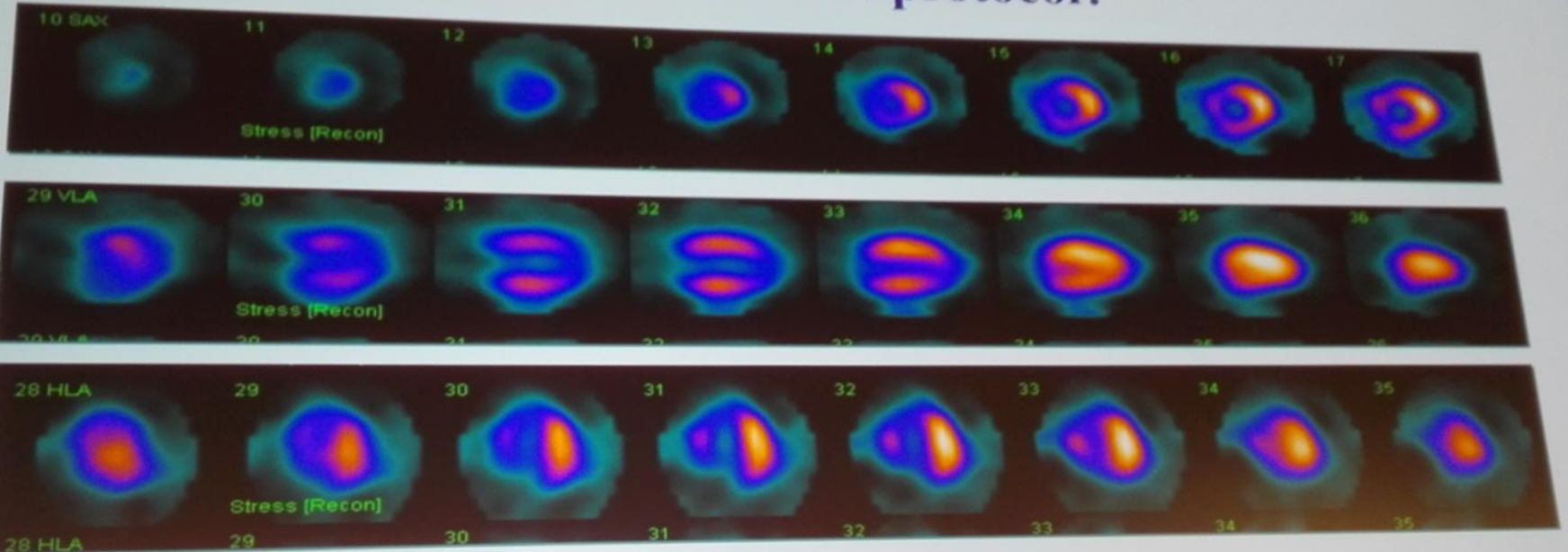
ICNC Nuclear Cardiology and Cardiac CT 2019, Lisbon

Stress first/only: pacientka má po zátěži těžkou poruchu perfuze anteroseptálně a apikálně

ECHO: normální funkce levé komory

Otázka: jaký je přínos doplňující klidové studie?

Our patient... What would we have done if she was tested using a selective stress first protocol?





American Society of Nuclear Cardiology

J Nucl Cardiol 2017

<https://www.asnc.org/guidelines>

ASNC CONSENSUS STATEMENT



Myocardial perfusion imaging in women for the evaluation of stable ischemic heart disease—state-of-the-evidence and clinical recommendations

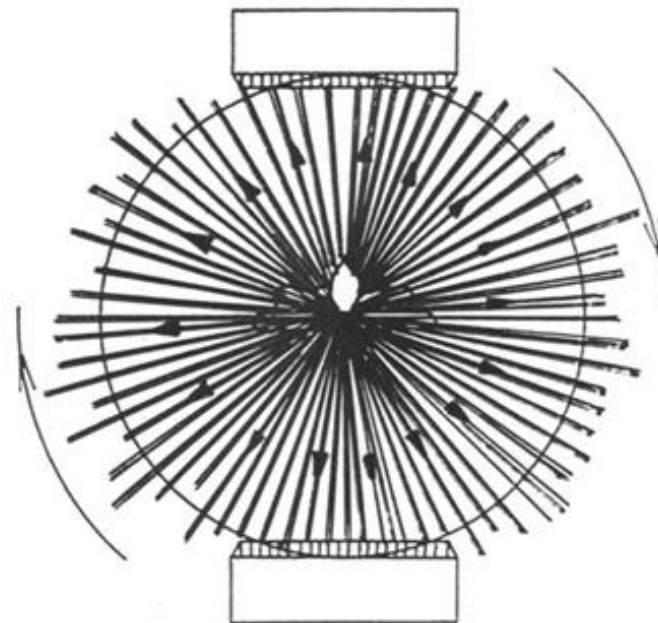
Viviany R. Taqueti, MD, MPH,^{a,b} Sharmila Dorbala, MD, MPH,^{a,b} David Wolinsky, MD,^c Brian Abbott, MD,^{d,e} Gary V. Heller, MD, PhD,^f Timothy M. Bateman, MD,^g Jennifer H. Mieres, MD,^h Lawrence M. Phillips, MD,ⁱ Nanette K. Wenger, MD,^j and Leslee J. Shaw, PhD^j

Neprovádět: **dual- izotopový protokol**

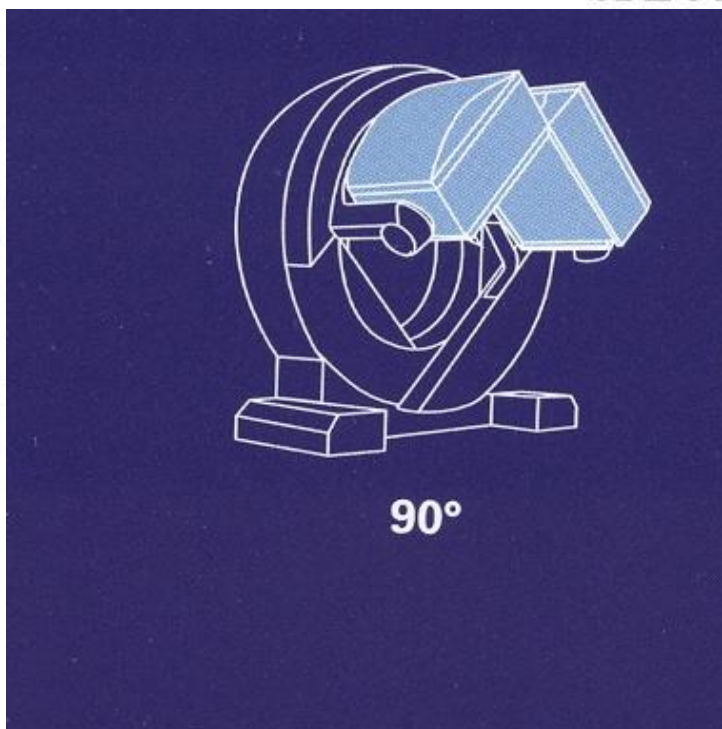
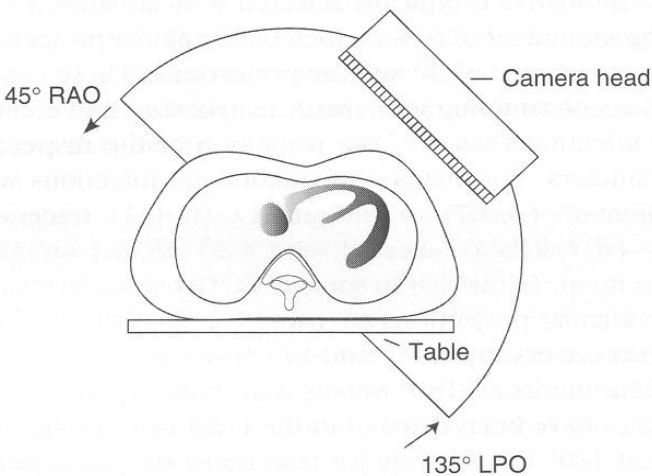
Preference: **stress only - stress first**

multidetektorová CZT kamera

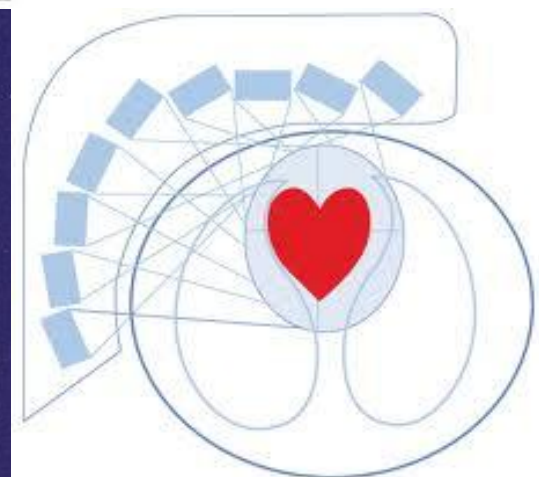
Single Photon Emission Computed Tomography



SPECT



90°



9 - 19

CZT detektoru

D-SPECT™ Cardiac Scanner

Dynamic SPECT
(D-SPECT)

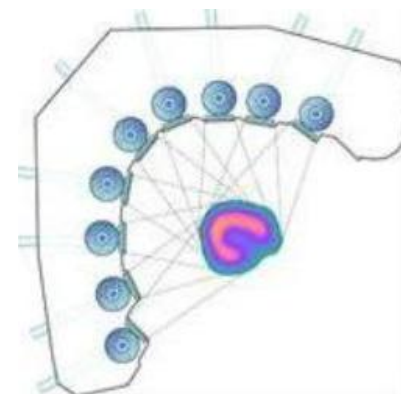
Spectrum-Dynamics
Haifa, Israel



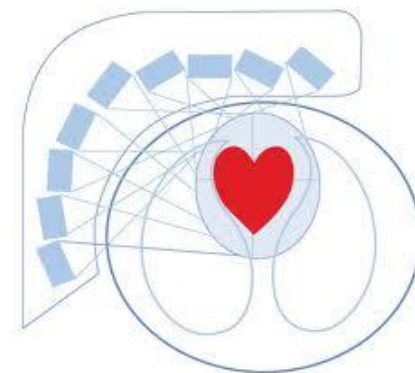
GE Discovery NM 530c



CZT detektory



9 detektorů



19 detektorů

PET like design



Strategies for radiation dose reduction in nuclear cardiology and cardiac computed

Best practice	Dose (mSv)
Prefer radiotracers with low radiation exposure ^{99m}Tc (stress/rest protocol, 4 mCi/12 mCi, respectively)	2–8
Check the possibility to perform stress-only acquisition (4 mCi)	≤ 2
Use weight-based radiotracer doses	
Avoid dual isotope imaging	>8