NUCLEAR CARDIOLOGY
AND
CARDIO SPECT
Nuclear Cardiology Update

SestaMIBI SPECT Study can measure
Perfusion and function of the left ventricle
Pulmonary Uptake of the Radiotracer
Ischemic Dilation of the left ventricle

Each of these measurements are unique, reproducible and have prognostic impact
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SestaMIBI SPECT Study can measure

- Perfusion and function of the left ventricle
- Pulmonary Uptake of the Radiotracer
- Ischemic Dilation of the left ventricle

LUNG-HEART RATIO

<table>
<thead>
<tr>
<th>Normalized Counts</th>
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<tbody>
<tr>
<td>Heart : 33.27</td>
</tr>
<tr>
<td>Lung : 9.96</td>
</tr>
<tr>
<td>Ratio : 0.30</td>
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SestaMIBI SPECT Study can measure

- Perfusion and function of the left ventricle +++
- Pulmonary Uptake of the Radiotracer +++
- Ischemic Dilation of the left ventricle +++

Global $\chi^2$
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SestaMIBI SPECT Study for the clinician

- **Indication**: when ECG-testing and Stress-Echo do not give conclusive results

- **Answers**: does the patient need to go to the cath-lab?

- **Has a very high sensitivity (90%) and a very high negative predictive value for major adverse cardiac events (MACE)**
The certainty of diagnosis

Ischemia present?

Yes, definitely

I think, that ...

No, definitely not

nuclear

echo
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Long-term Prognosis of SestaMIBI SPECT (mean FU 6 years) in 519 Patients in Relation to Perfusion Defects after Physical Exercise (KVM 04/2009)
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Cardio-SPECT: what's that?
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Cardio SPECT is the way, I perform nuclear cardiology

• simultaneous assessment of left and right ventricular function with Echo

• better characterization of the diagnostic significance of increased LHR and TID

• increased patient safety due to early detection of significant ischemia during exercise
Diagnostic algorithm of Cardio SPECT

- pretest probability for ischemia
- symptoms and signs during exercise
- ECG changes, BP, heart rhythm
- Exercise Echo, where feasible
- Myocardial perfusion at rest, after exercise
- LHR (pulmonary congestion)
- TID (ischemic dilation)

Final Interpretation and therapeutic directions
1. Perfusion of the left ventricle, reorientations and polar maps

Perfusion defect size at rest
% PDR = usually scar

May be differentiated:
- transmural scar = non vital uptake >50%
- = vital
1. Perfusion of the left ventricle, reorientations and polar maps

Perfusion defect size at exercise
% PDS = usually scar + ischemia

May be differentiated:
large ischemia > 11% →
cath lab or intensive medical treatment
2. Increased lung uptake

Increased LHR > 0.5 is an independent marker of MACE

Occurs in

- global ischemia
- diastolic dysfunction
- capillary leakage of non cardiac origin (usually pulmonary damage)

Further differentiation with ECHO
2. Transient ischemic dilation ratio (TID)

Normal value depends on baseline LV VOL, usually TID > 1.17 is pathologic

Occurs in
- global ischemia
- subendocardial ischemia

Further differentiation with ECHO
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Future Reporting of Results

PDS
PDR
% ISCHEMIA
LHR
TID

Comprehensive Report from the Nuclear Cardiology Department
Which stress test?

1. Exercise testing is preferred, because it replicates real life:
   - get’s more information on incident recruitment of collaterals
   - Can produce coronary spasm
   - Prognosis is usually good with normal SPECT and submaximal exercise (own 6 year observation data published 04/2009)

2. Adenosin + low level exercise
3. Dobutamin (+ low level exercise ?)
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What we need to know about your patient

All known diagnoses
Current medication
Indication and Questions
Should antianginal medication be stopped before the test
How to refer subjects / MD responsibilities at SoH

Take the phone 062 212 44 10
Discuss the problem
Get an appointment (stationary, ambulatory)
062 311 42 66

You may refer the ambulant patient to Kardiolab, then
I do the testing and I am the only responsible
doctor (by contract, Belegarzt)
You may refer the stationary patient to the Radiologist,
then I may be asked to participate as a consultant
(by contract, Konsiliararzt)
# Nuclear Cardiology Update

## What expects the patient

<table>
<thead>
<tr>
<th>Small breakfast</th>
<th>Take medication as appropriate</th>
<th>Come to the nuclear cardiology department</th>
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<tr>
<td>Get your sestaMIBI radiotracer injection (08:15-10:45)</td>
<td>Eat a breakfast (1/2 L Milk, 1 Sandwich)</td>
<td>Get resting images on the SPECT camera</td>
</tr>
<tr>
<td>Feel free until you get the exercise test (from 13:00)</td>
<td>Get the exercise test and the SPECT images (20 Min)</td>
<td>Get the results and the recommendations</td>
</tr>
<tr>
<td>Abstain from coffee, black tea and chocolate during the exam</td>
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Michel Romanens, MD 07/2009
Results from nuclear cardiology

Planar: Lung heart ratio nach Belastung 0.37.
SPECT qualitativ: Stressdefekt inferoposterior ohne Reversibilität in Ruhe.
SPECT quantitativ: Stressdefekt 34%, Ruhedefekt 37%.
Quantitative Gated SPECT (Cedars Sinai): Ruhe EF 39 % (Norm >45%), EDV 177 ml.
TID-Ratio: 1.01
Final comprehensive comment

Summarizes the final diagnosis from Cardio SPECT clinical / exercise test / echo / nuclear

Weighs the clinical significance of the final diagnosis

Gives recommendations for the patients management and eventual follow-up by the cardiologist
Major Indications and Advantages of Cardio SPECT

Reliable Results with huge testing and imaging experience

Can reliably define the indication for invasive testing

Chronic Angina: assess extent of ischemia (relatively frequent indication)

Unstable Angina: assess risk if other measures (lab, echo) do not give conclusive results (rare indication)
Hybrid Imaging

Nuclear + MSCT of coronary arteries

DIAGNOSTIC IMPROVEMENT: Rarely indicated (e.g. inconclusive SPECT results)

PROGNOSTIC IMPROVEMENT: small, can be done with carotid imaging as well, saves about 1000 CHF!

Hybrid Imaging with MSCT is experimental and may increase radiation burden
Ongoing Scientific Work

1. VOL (N=731, ungated left ventricular volumes) predicts LVEF (adjusted r2=0.59, ROC to detect LVEF < 40% =98%)

2. TID normal values are dependent from baseline LVEDV, ongoing data collection

3. Ability of ECHO-TDI (E’ and E’/A) to detect increased LHR as defined by SestaMIBI
Example of extensive anterior ischemia treated medically

**Effect of intensive medical treatment measured at baseline and after one year of intensive medical treatment:**

- Anterior perfusion defect has disappeared completely
- Probably due to the effect of collaterals or regression of coronary atherosclerosis