

Nuklearmedizinische Vorlesung

Herz / Kreislauf II

Univ.-Prof. Dr. Michael Schäfers

Klinik und Poliklinik für Nuklearmedizin

Universitätsklinikum Münster

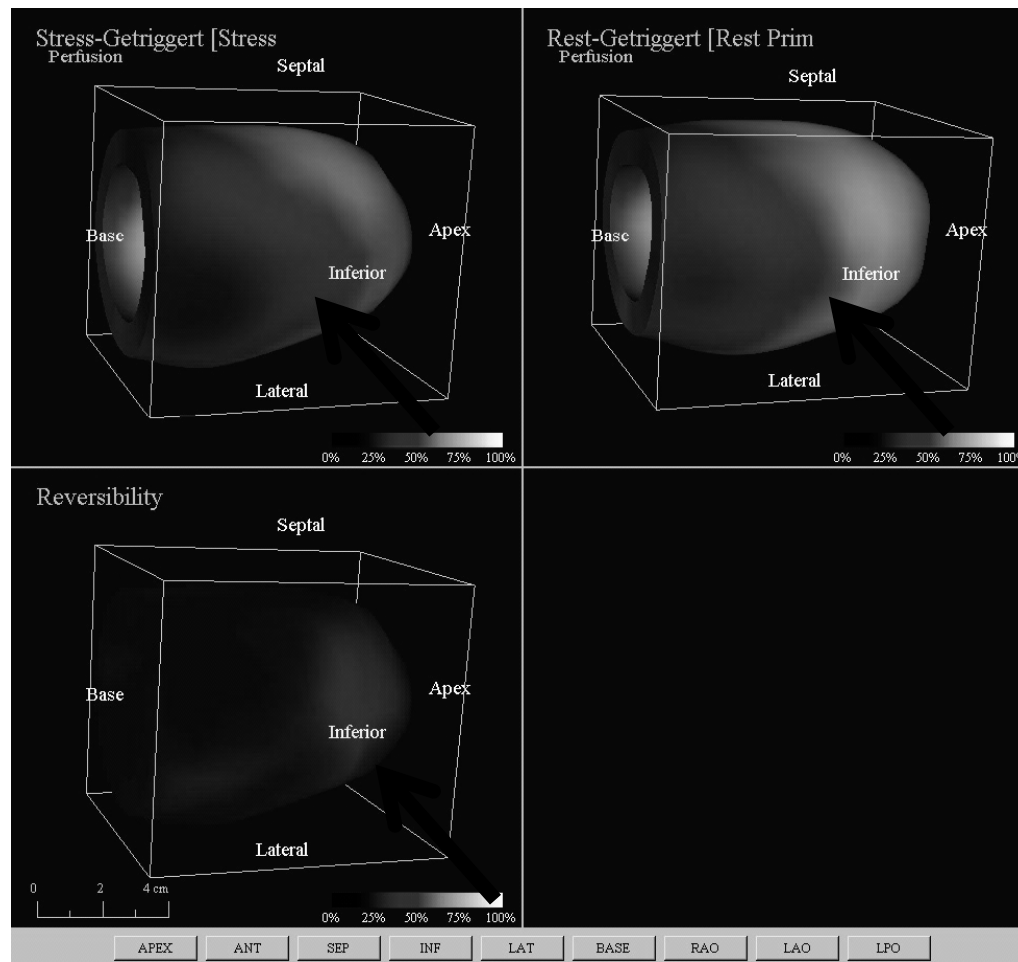
- Rationale
- Prinzipien, Technik
 - Perfusion
 - Perfusionsreserve
 - Kontraktion
 - Vitalität
- Fallbeispiele
- Prognoseabschätzung
- Multimodale Bildgebung
- Zukunft

Fallbeispiel #3: Narbe + Ischämie

Stress

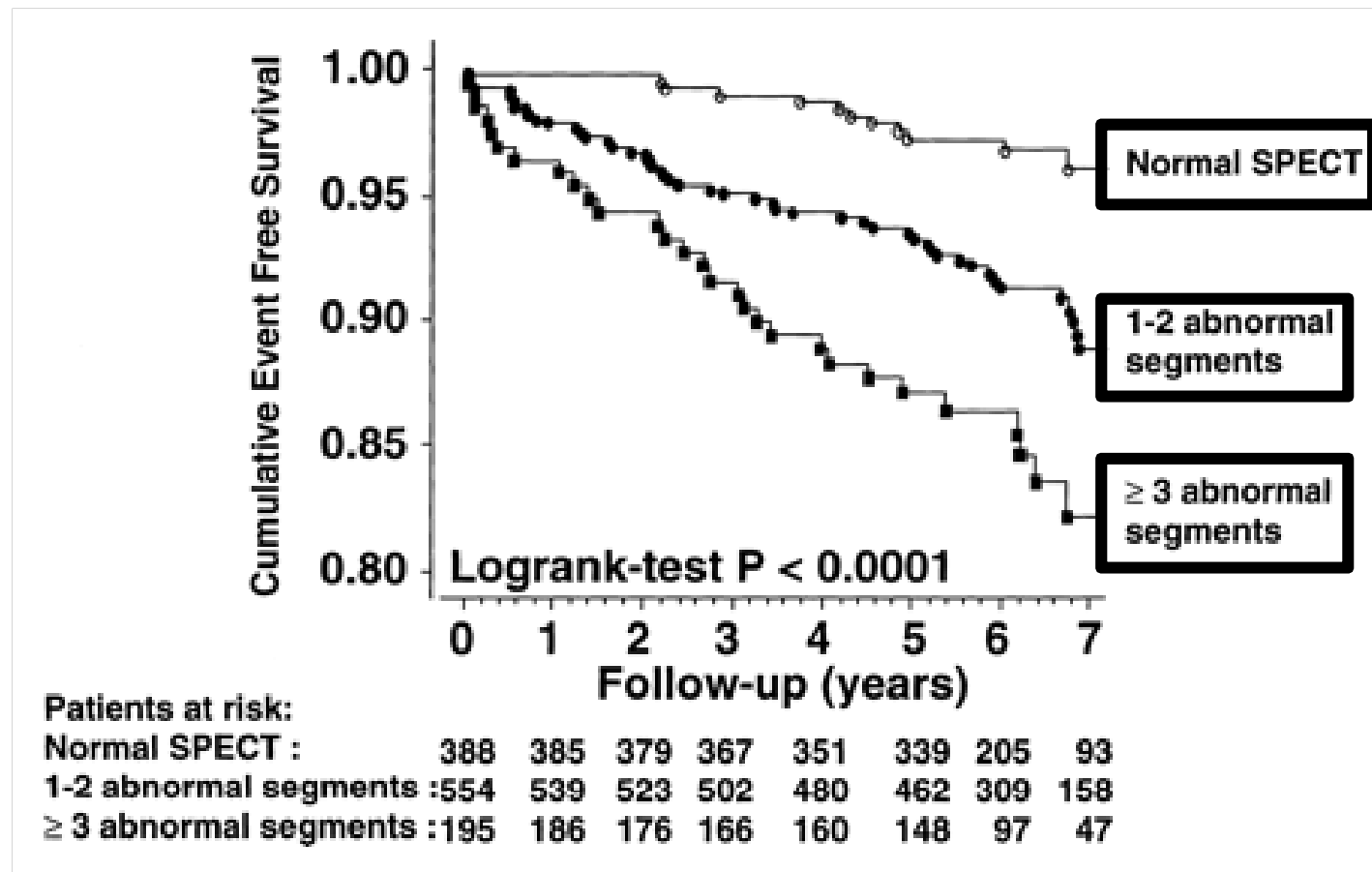
Ruhe

$$\Delta = \text{Ruhe} - \text{Stress}$$

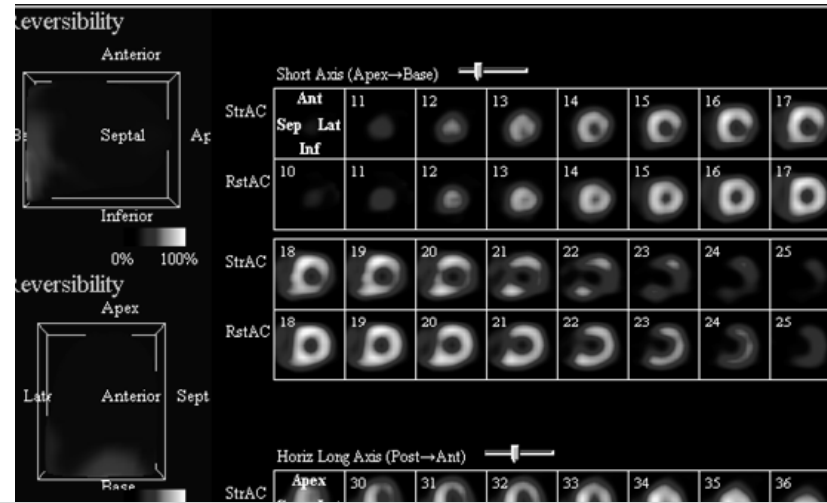
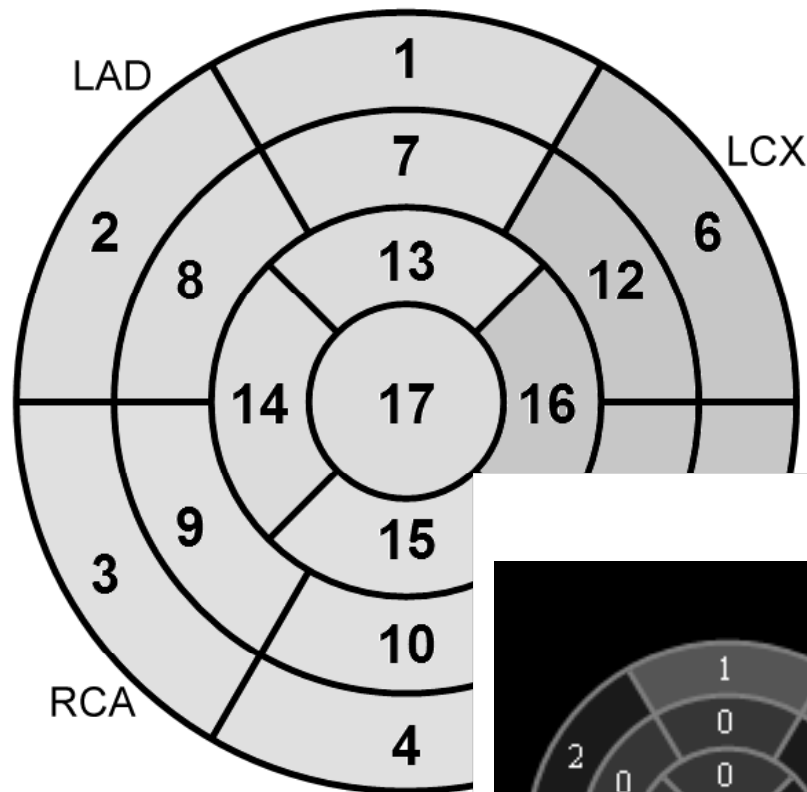


Ischämiegrad versus Risiko

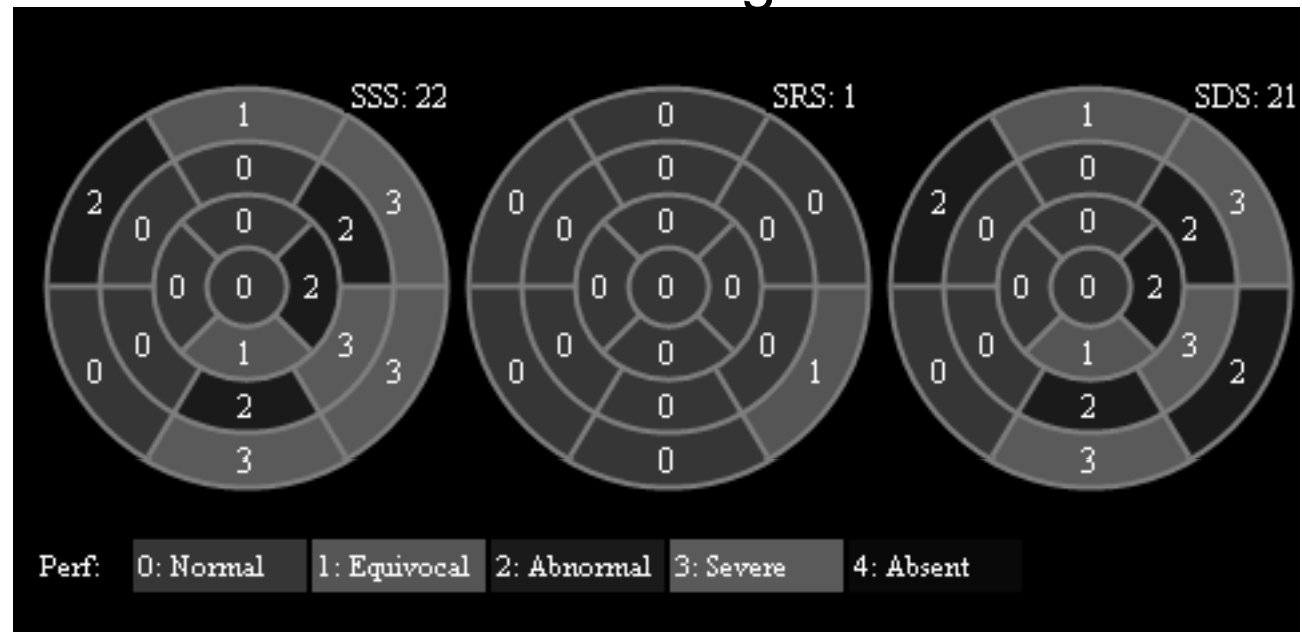
- 1137 Patienten, mittleres a-priori Risiko
- Myokard-SPECT (Thallium-201)



Prognose-Scores ?



Scoring

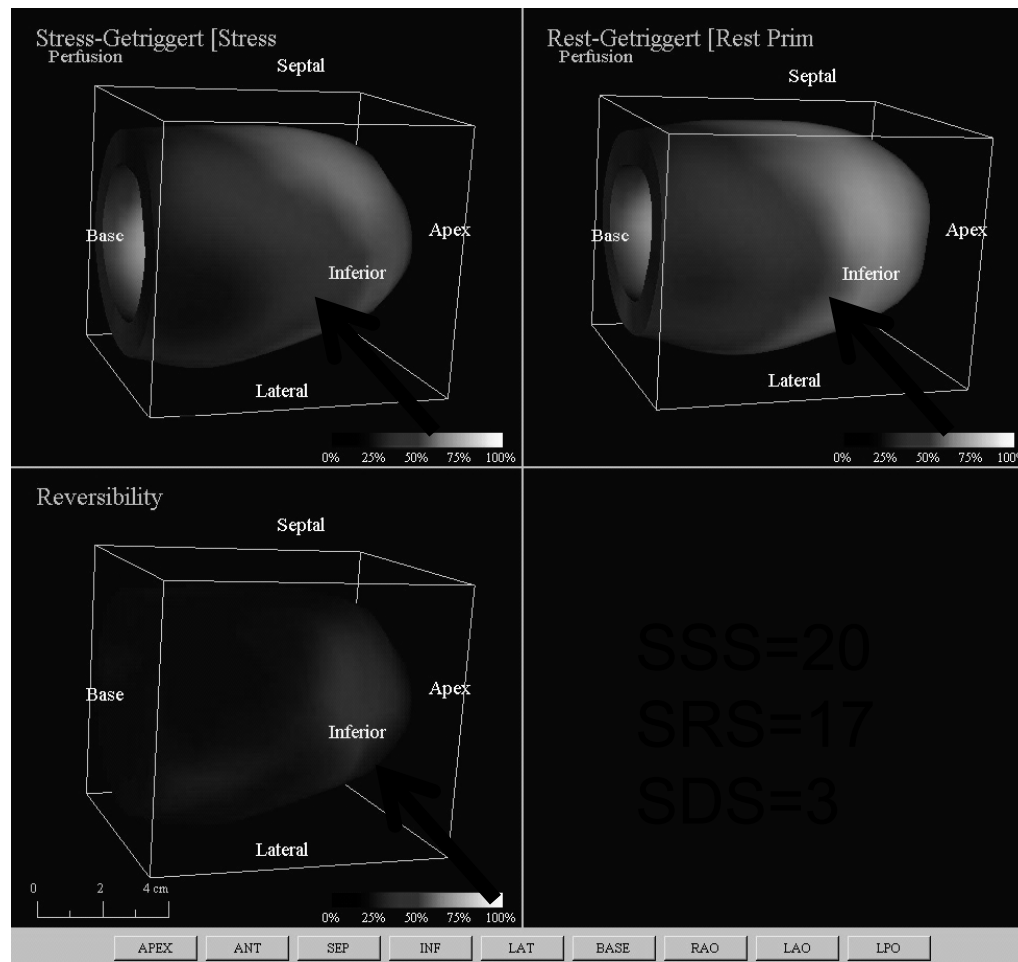


Fallbeispiel #3: Narbe + Ischämie

Stress

Ruhe

$$\Delta = \text{Ruhe} - \text{Stress}$$



Fallbeispiel #4

- Patient männlich, 68 Jahre
- 3-Gefäß-KHK, kein Herzinfarkt
- Keine aktuellen Beschwerden, Routinekontrolle
- Letzte Kontrolle vor 2 Jahren o.B.
- Was ist sinnvoll ?

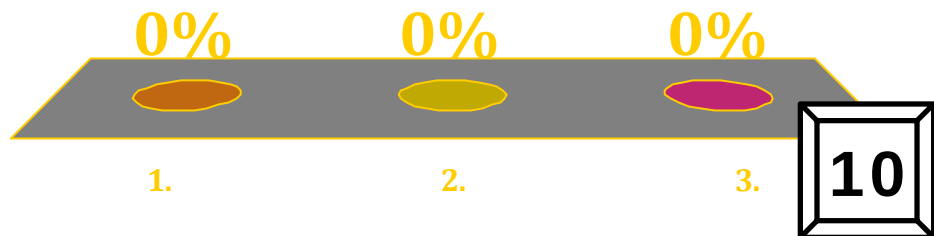
Bitte wählen Sie:

1. Belastungs-EKG
2. Myokard-Szintigraphie
3. Echokardiographie

Fallbeispiel #4: Befund ?

1. Belastungs-EKG
2. Myokard-Szintigraphie
3. Echokardiographie

0 of 30

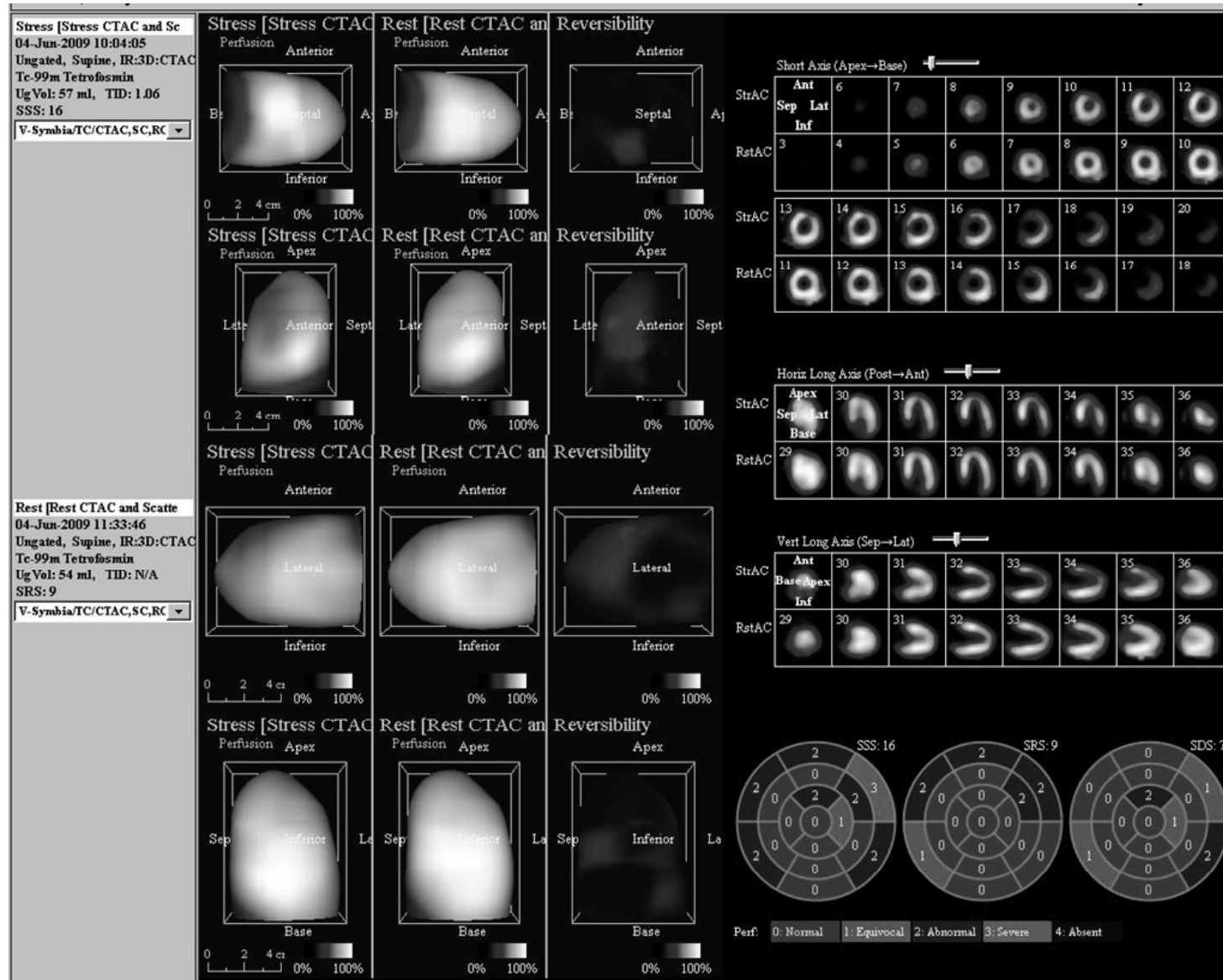


Fallbeispiel #4

- Patient männlich, 68 Jahre
- 3-Gefäß-KHK, kein Herzinfarkt
- Keine aktuellen Beschwerden, Routinekontrolle
- Letzte Kontrolle vor 2 Jahren o.B. (CAVE Progress)

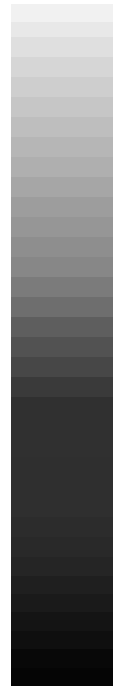
- Ergometrie
 - 2 min 50 Watt, 2 min 100 Watt , 2 min 150 Watt
 - HF Ruhe 54/min, HF Stress 140/min
 - RR Ruhe 140/70 mmHg, RR Stress 175/100 mmHg
 - EKG: asc. ST-Senkung 0.2 mV in V3-V5 (wie zuvor)

Fallbeispiel #4



Fallbeispiel #4: Befund

100 %



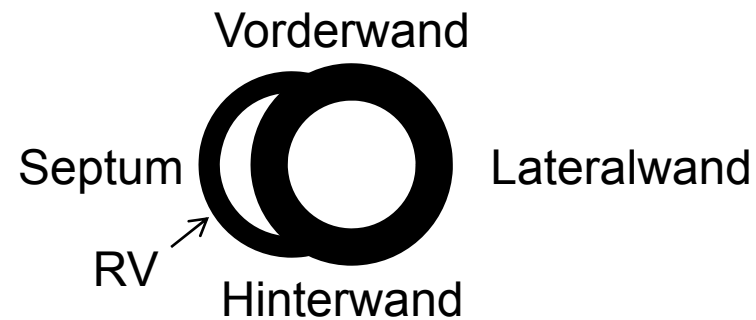
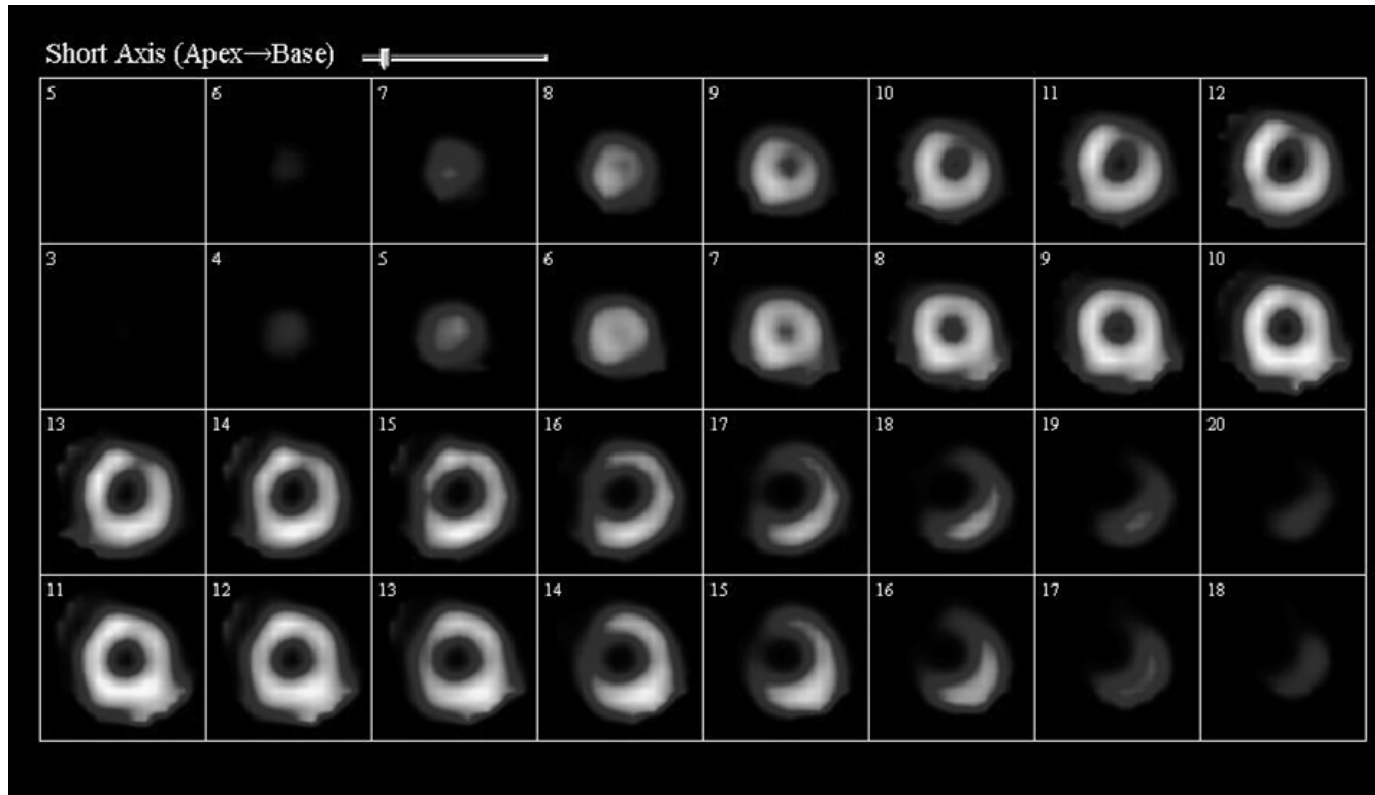
0 %

Stress

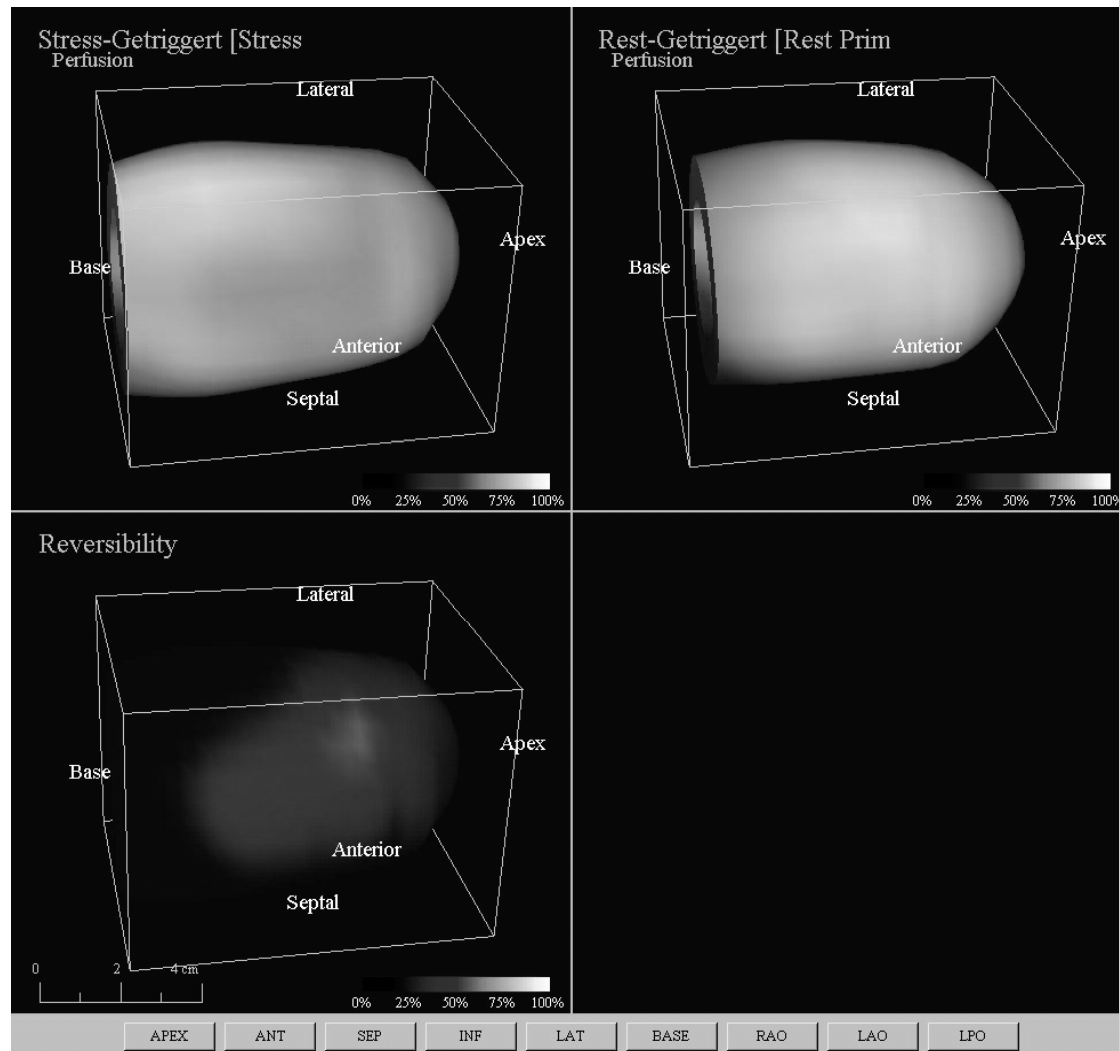
Ruhe

Stress

Ruhe



Fallbeispiel #4: Befund

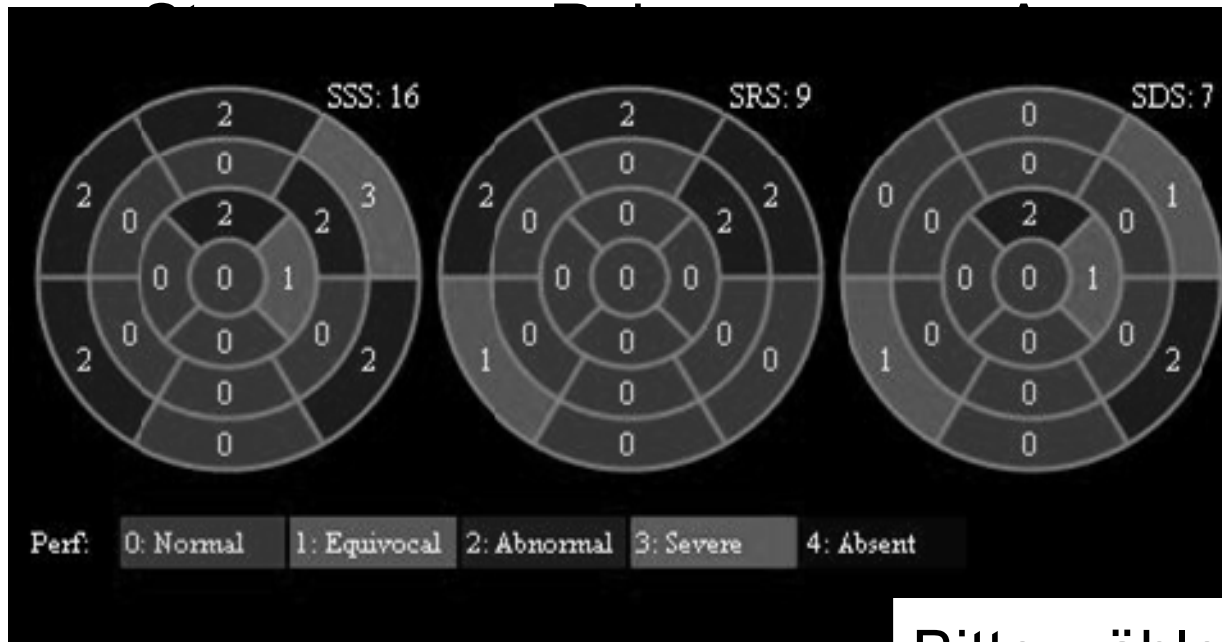


EDV: 84 ml [101-165]

ESV: 27 ml [28-64]

EF: 68 % [59-73]

Fallbeispiel #4: Befund ?

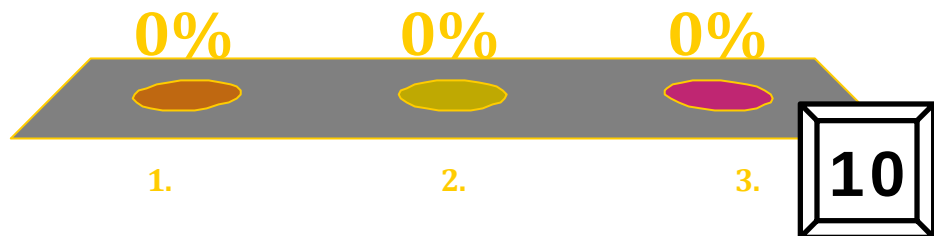


Bitte wählen Sie:

1. Belastungsinduzierte Ischämie anterolateral
2. Transmurale Narbe mediales und basales Septum
3. Unauffälliger Befund

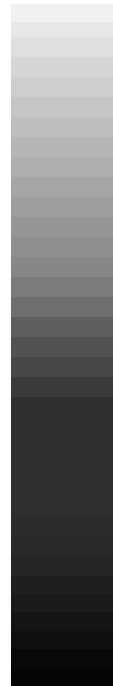
Fallbeispiel #4: Befund ?

1. Belastungs-induzierte Ischämie anterolateral
2. Transmurale Narbe mediales und basales Septum
3. Unauffällig



Fallbeispiel #4: Ischämie anterolateral

100 %



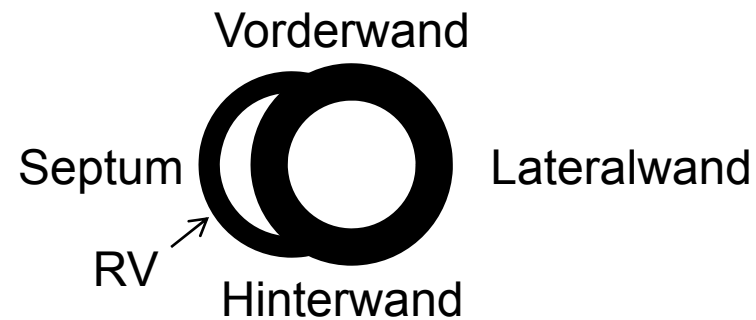
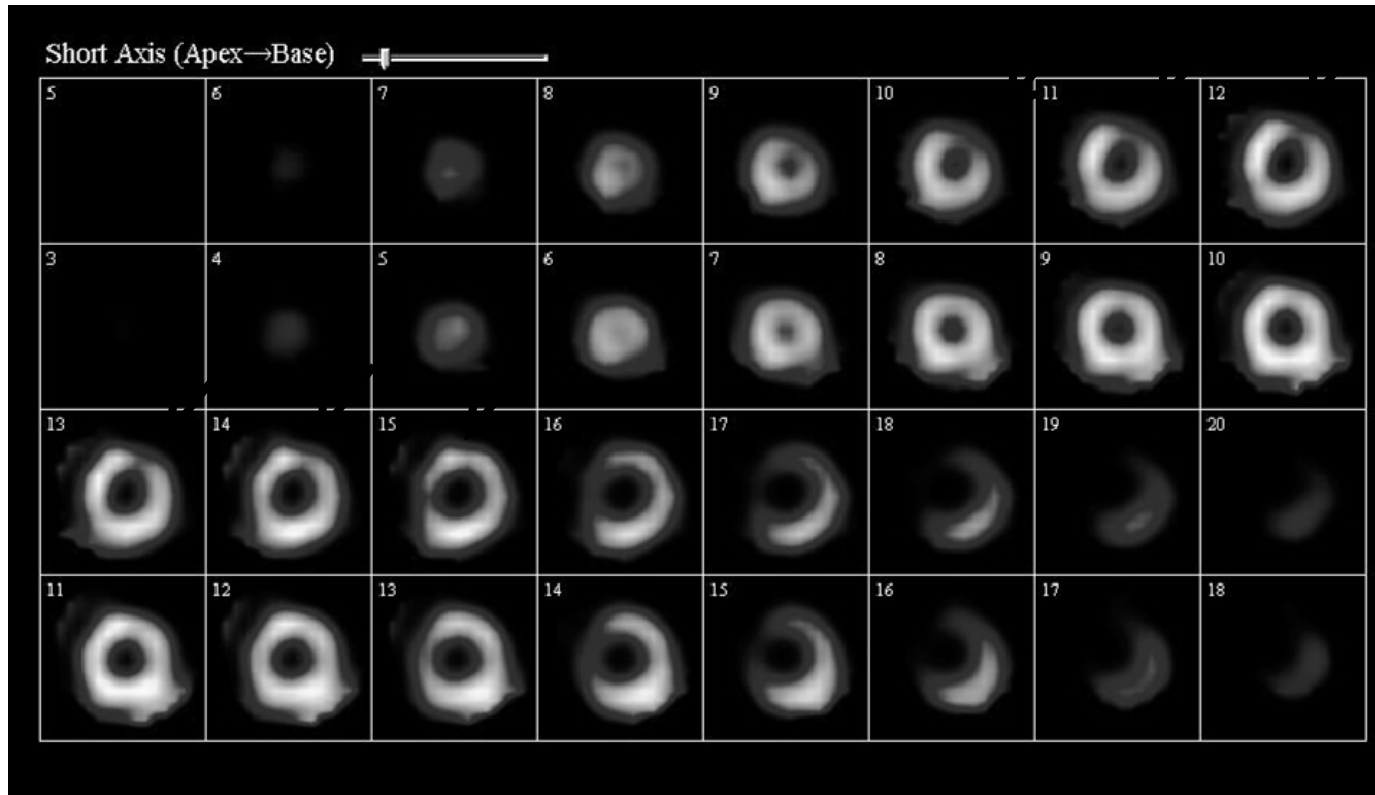
0 %

Stress

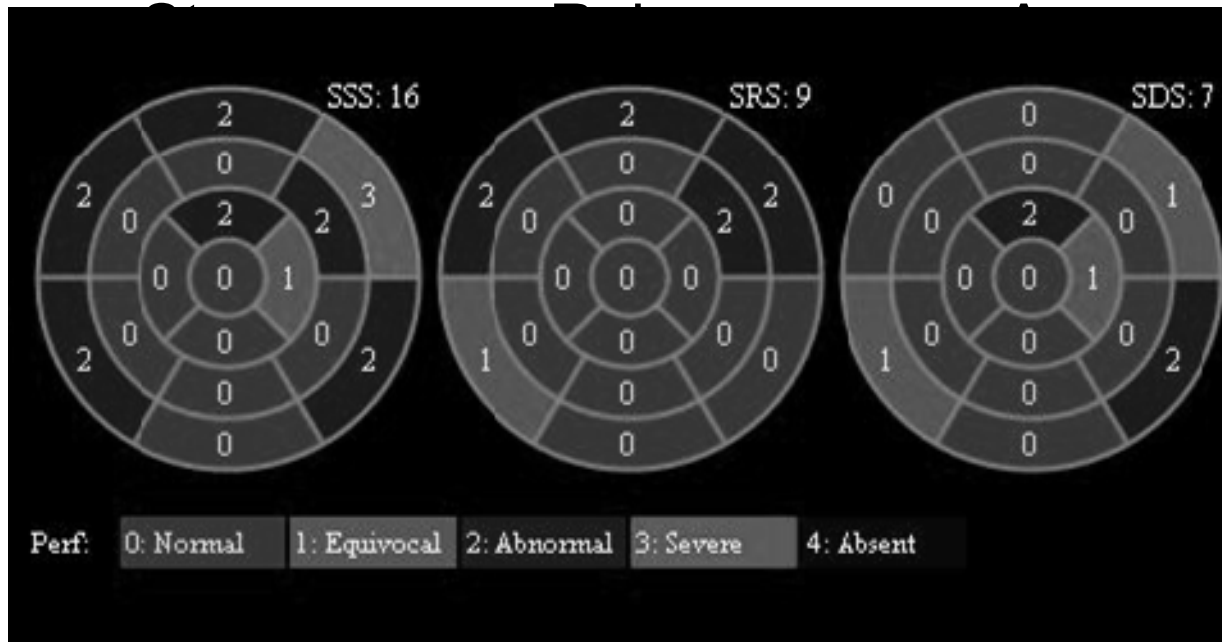
Ruhe

Stress

Ruhe



Fallbeispiel #4: Weiteres Procedere ?



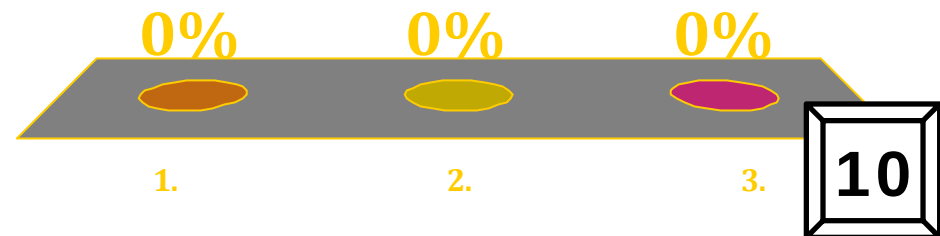
Bitte wählen Sie:

1. Keine weitere Diagnostik
2. Herzkatheter
3. Bypass-OP

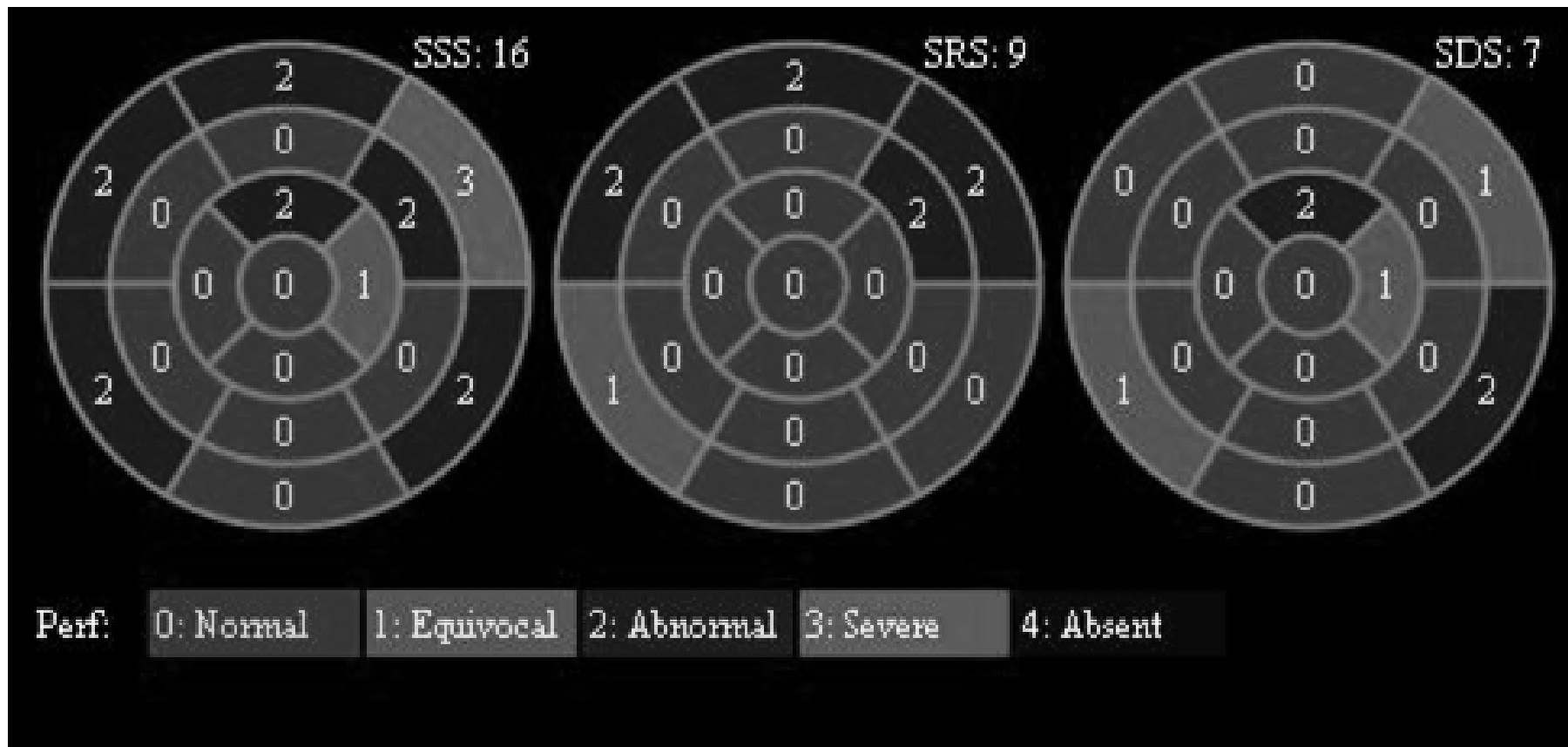
Fallbeispiel #4: Weiteres Procedere ?

1. Keine weitere Diagnostik
2. **Herzkatheter**
3. Bypass-OP

0 of 30

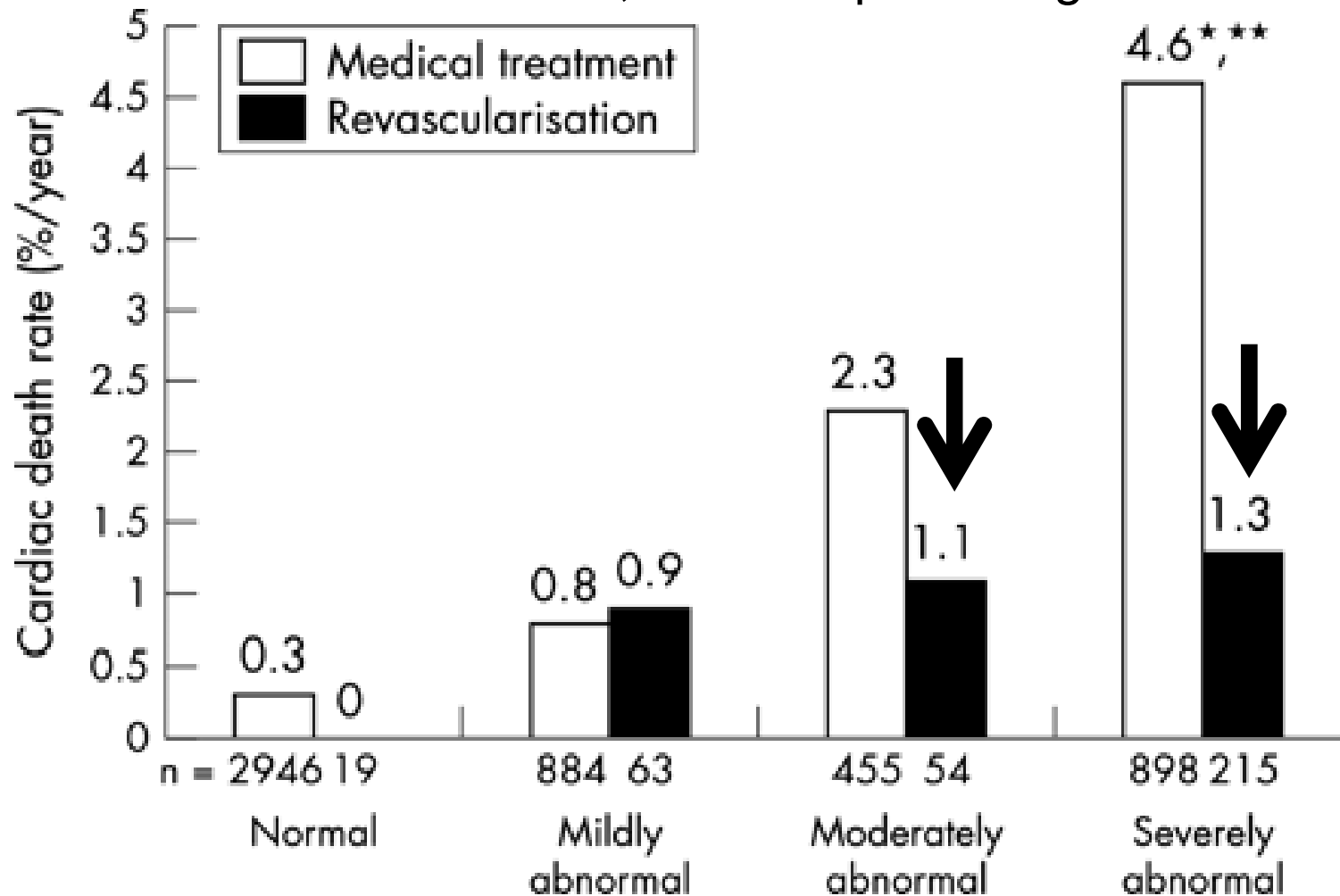


Fallbeispiel #4: Scores = Hohes Risiko

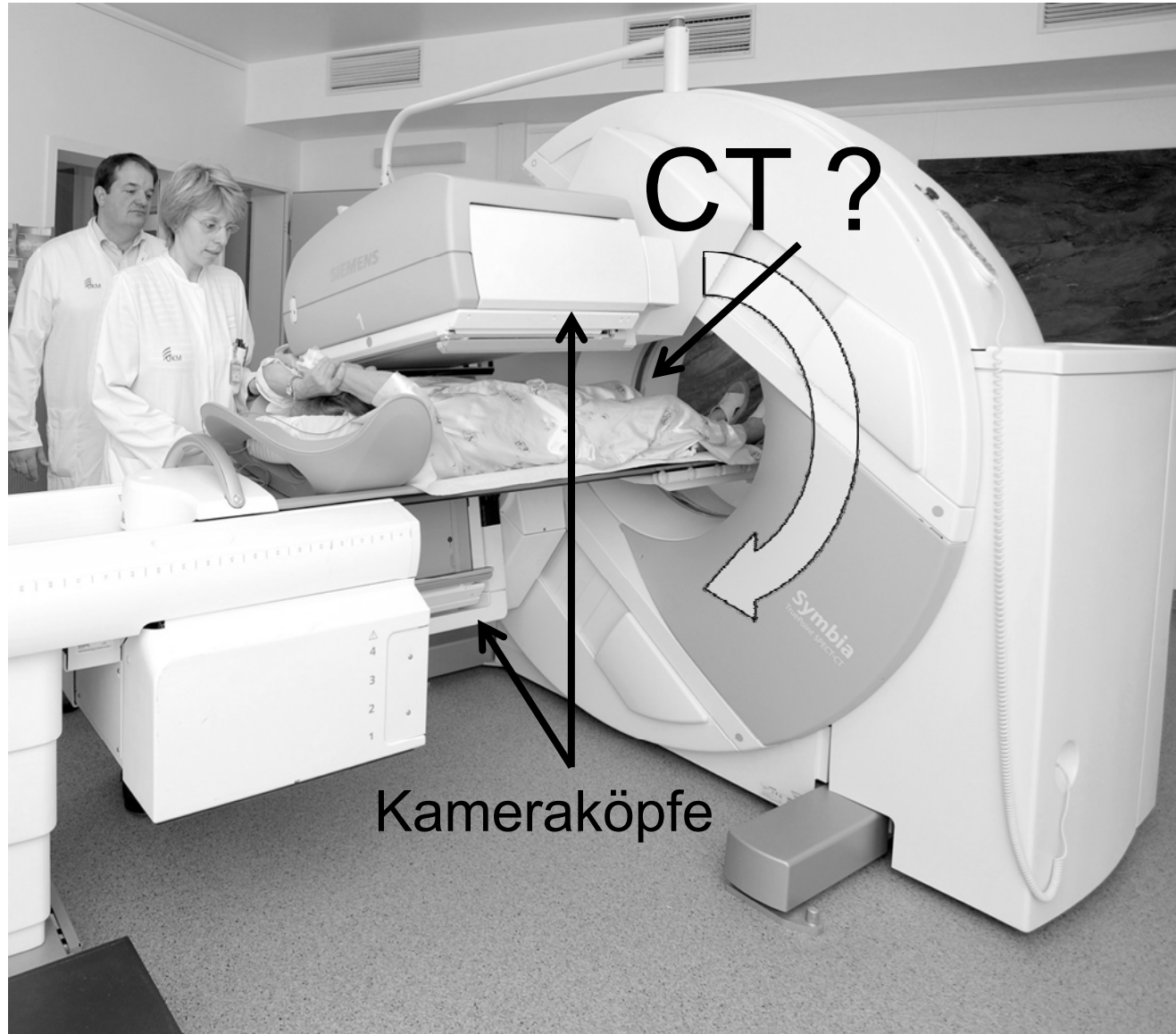


Prognose und Therapie

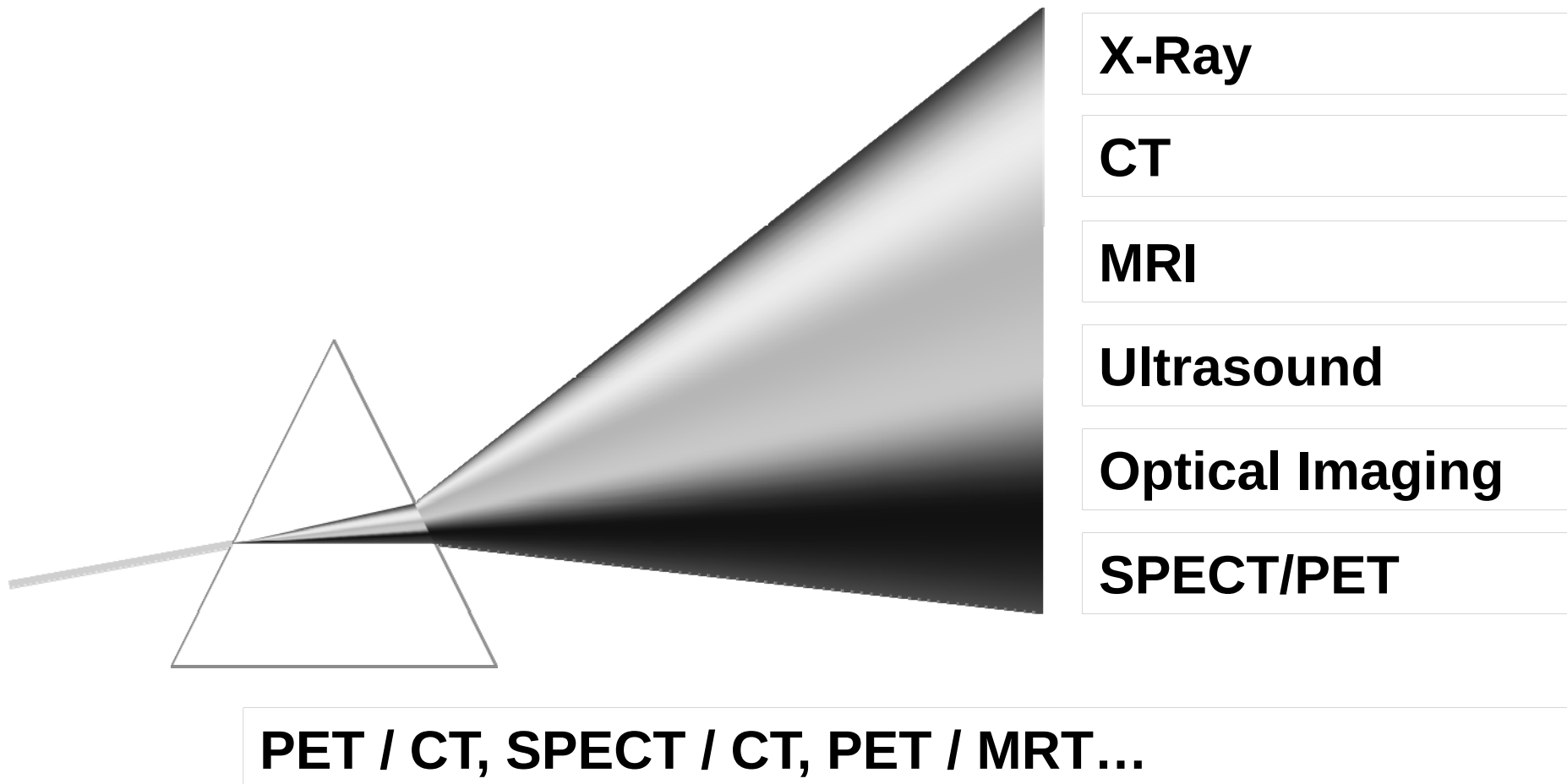
5183 Patienten, V.a. KHK und bekannte KHK
Stress ^{99m}Tc -MIBI, Follow-Up 640 Tage



SPECT/CT-Kamera - Herzbildgebung



Question ► **Diagnosis** ► **Molecular**



Findings CTA

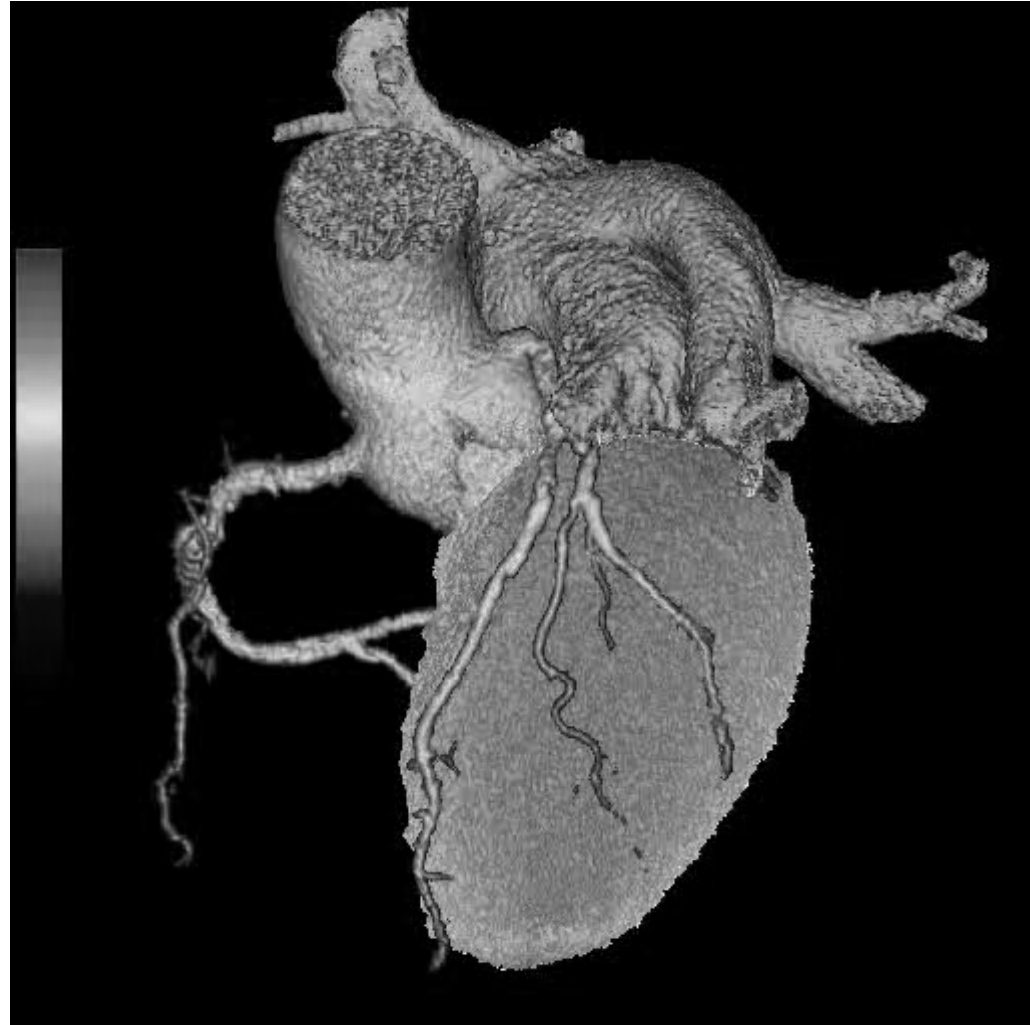
- Calcifications !
- LAD 50% stenosis
- LAD-D1 >50% stenosis
- LCX anomalous origin from RCA
- RCA calcification, no stenosis

Findings PET

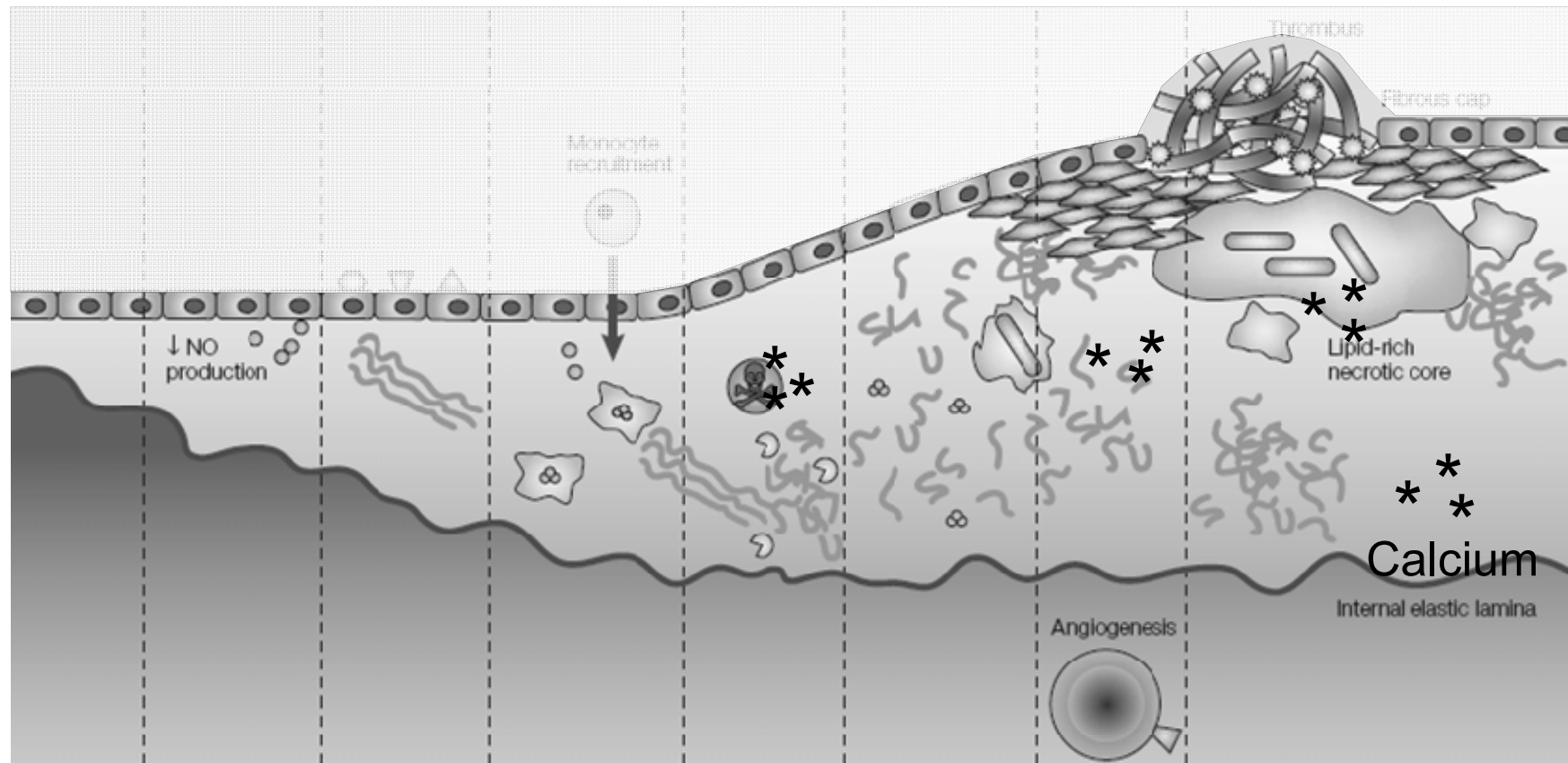
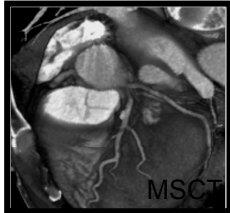
- Stress-induced ischemia anterior/lateral

Conclusion PET/CT

- Revascularization



Kalk in der Gefäßwand ...



Bildgebung der Arteriosklerose - Calcium



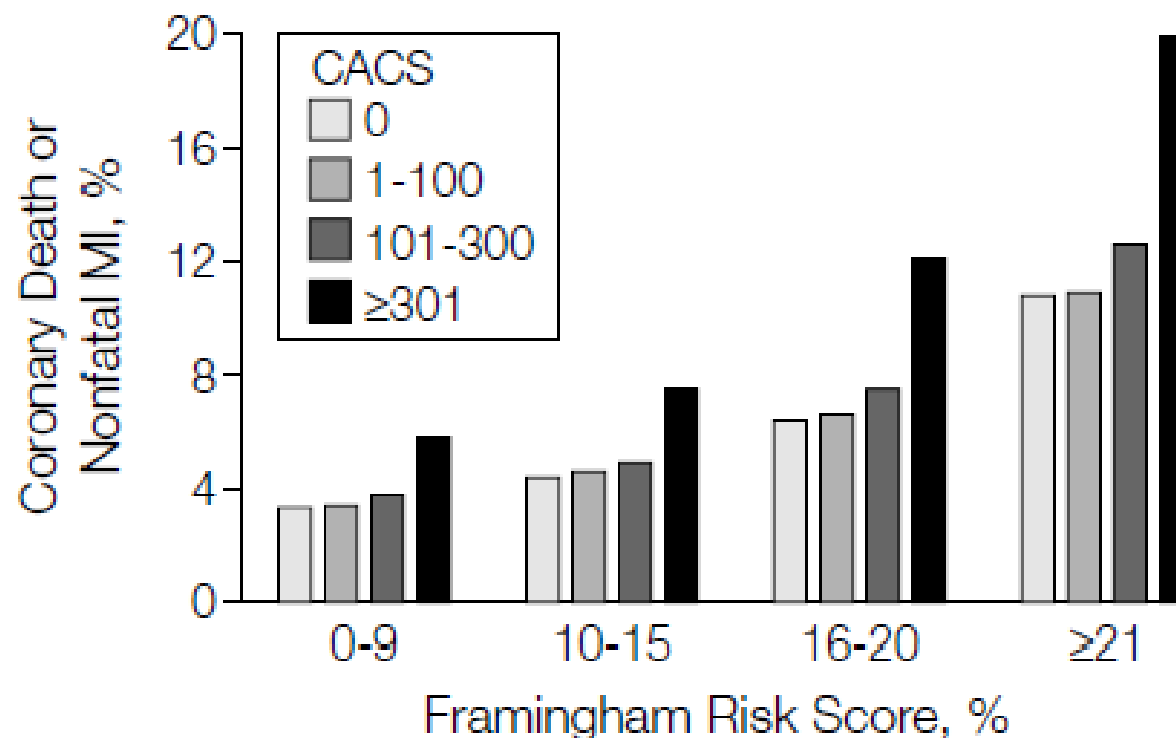
heute



Ägypten
vor
3000
Jahren !

Calcium-Score – Kardiovaskuläres Risiko

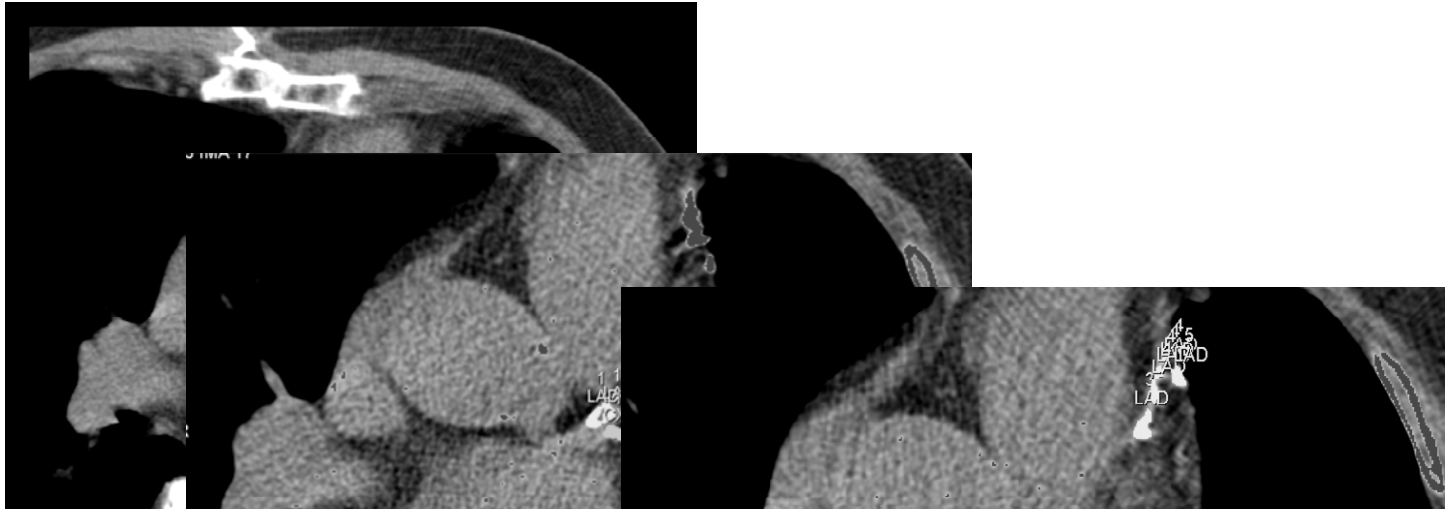
Figure 1. Predicted 7-Year Event Rates From COX Regression Model for CHD Death or Nonfatal Myocardial Infarction for Categories of FRS or CACS



Fallbeispiel #5

- Patient männlich, 53 Jahre
- V.a. KHK
- Pos. Familienanamnese
- Viele Risikofaktoren
- Keine Beschwerden, wünscht Abklärung

Fallbeispiel #5: Calcium-Score



Bitte wählen Sie:

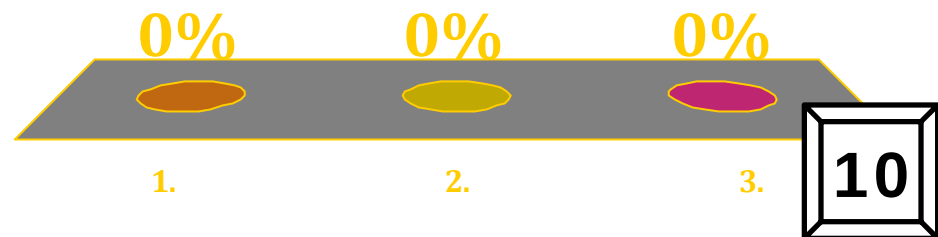
1. Belastungsinduzierte Ischämie Vorderwand
2. Belastungsinduzierte Ischämie Lateralwand
3. Keine Ischämie

Schwellenwert = 130 HU (97.5 mg/cm ³ CaHA)				
Arterie	Anzahl von Läsionen (1)	Volumen [mm ³] (3)	Äquiv. Masse [mg CaHA] (4)	Ergebnis (2)
LM	0	0.0	0.00	0.0
LAD	3	454.0	103.70	618.8
CX	1	41.2	7.95	52.2
RCA	9	183.7	41.29	284.8
Gesamt	13	678.9	152.94	955.8

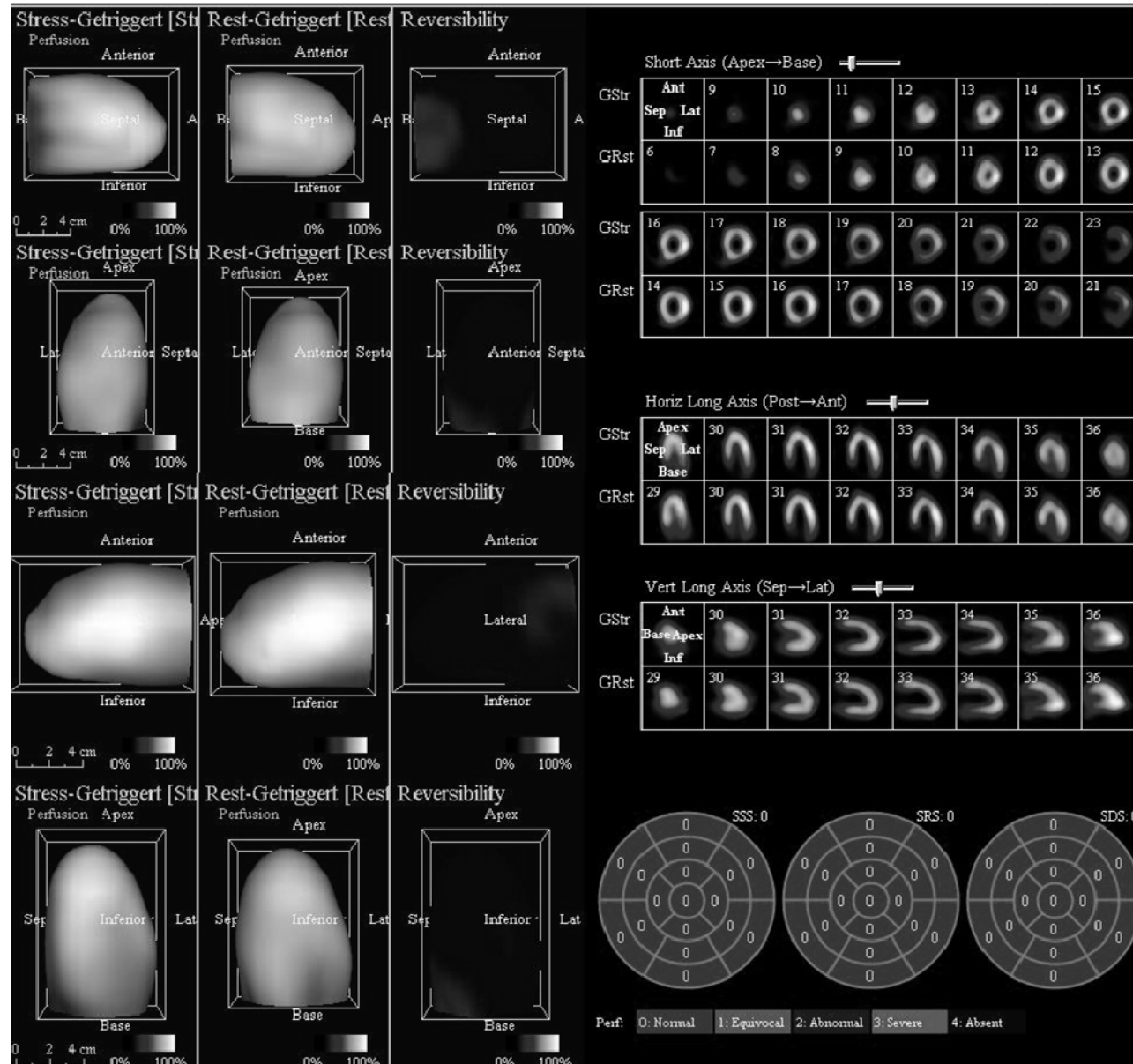
Fallbeispiel #5: Perfusion ?

1. Belastungs-
induzierte
Ischämie
Vorderwand
2. Belastungs-
induzierte
Ischämie
Lateralwand
3. Keine Ischämie

0 of 30

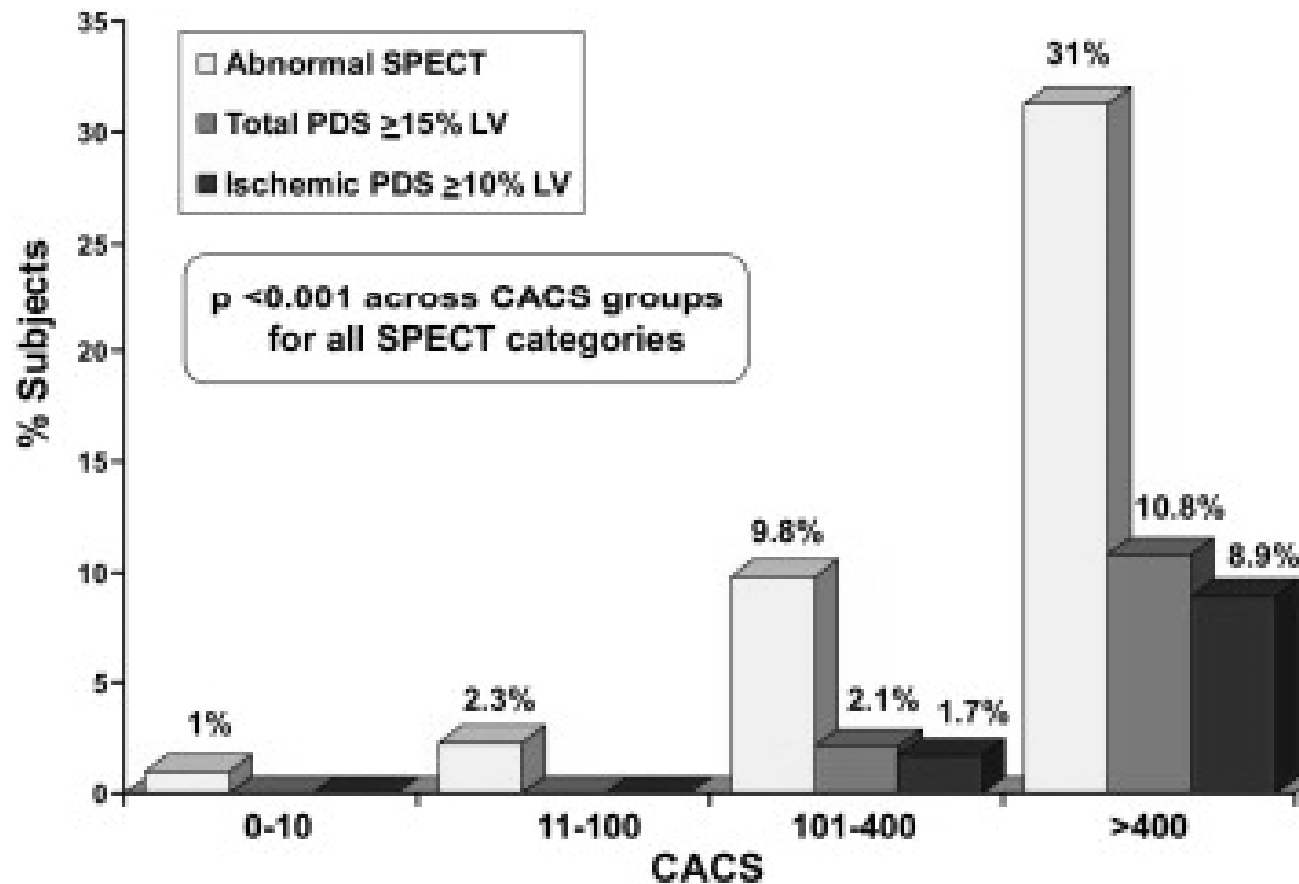


Fallbeispiel #5: Unauffällige Perfusion



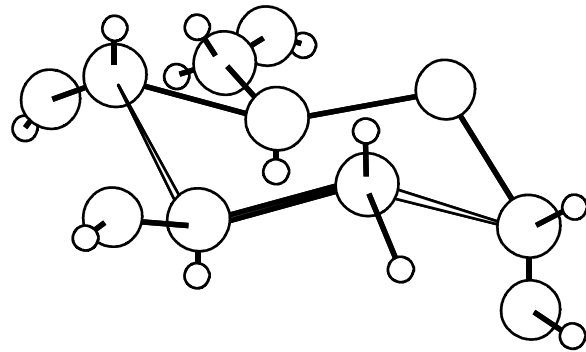
Calcium Score - Perfusion

1127 asymptomatic Patienten ohne bekannte KHK
Calcium-Score + SPECT, Follow-Up 6.5 Jahre



- Perfusion
- Perfusionsreserve
- Kontraktion
- Prognose-Score
- Calcium-Score
- Vitalität ?

Vitalitätsdiagnostik mit FDG-PET



D-Glucose



D-Glucose



Hexokinase

D-Glucose-6-
Phosphate



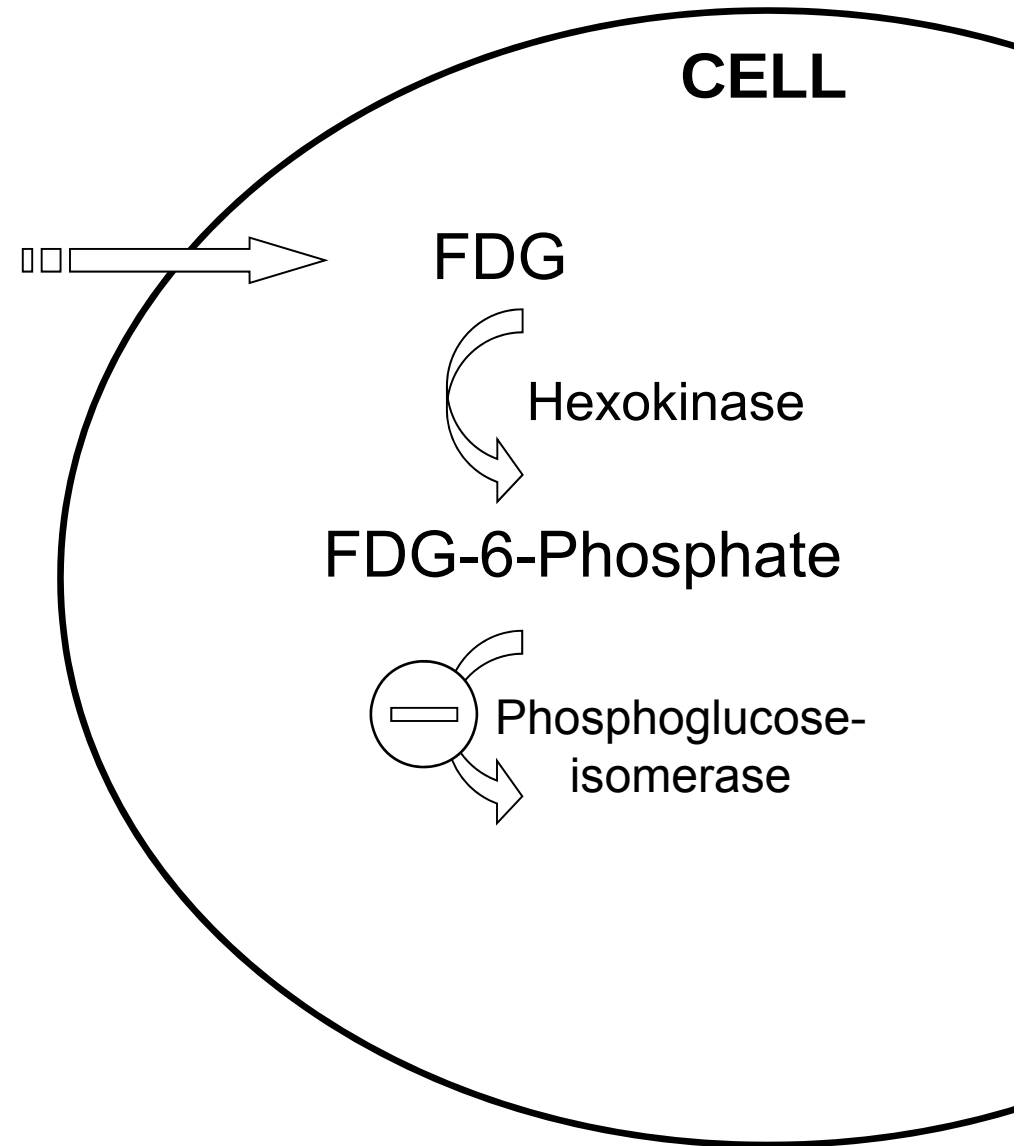
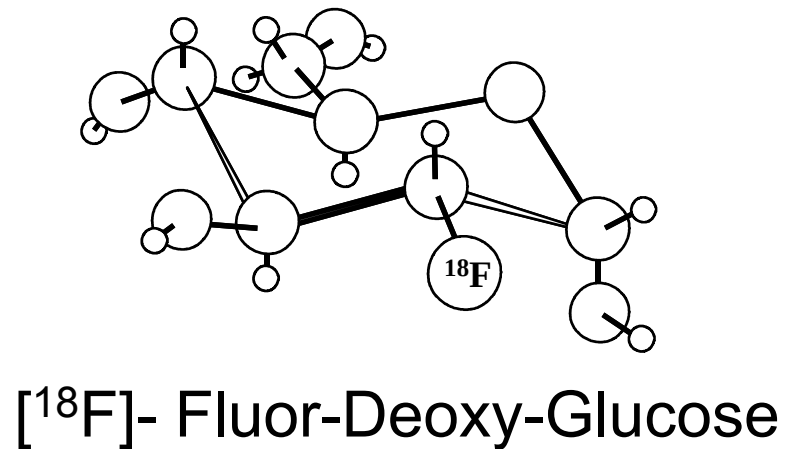
Phosphoglucose-
isomerase

Fructose-6-Phosphate

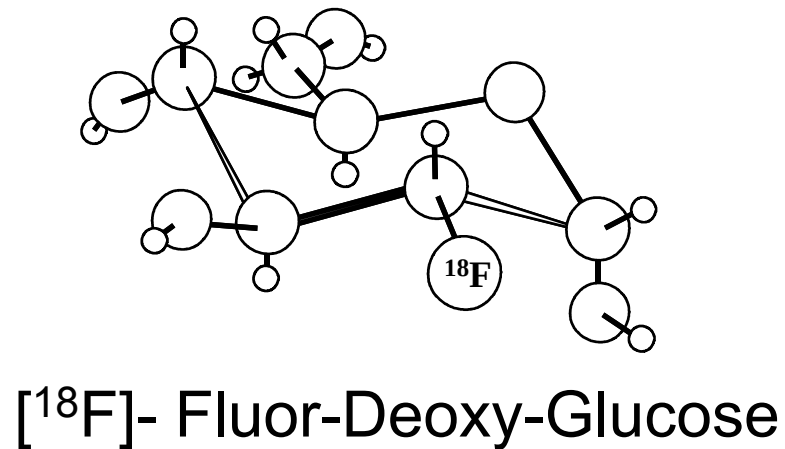


CELL

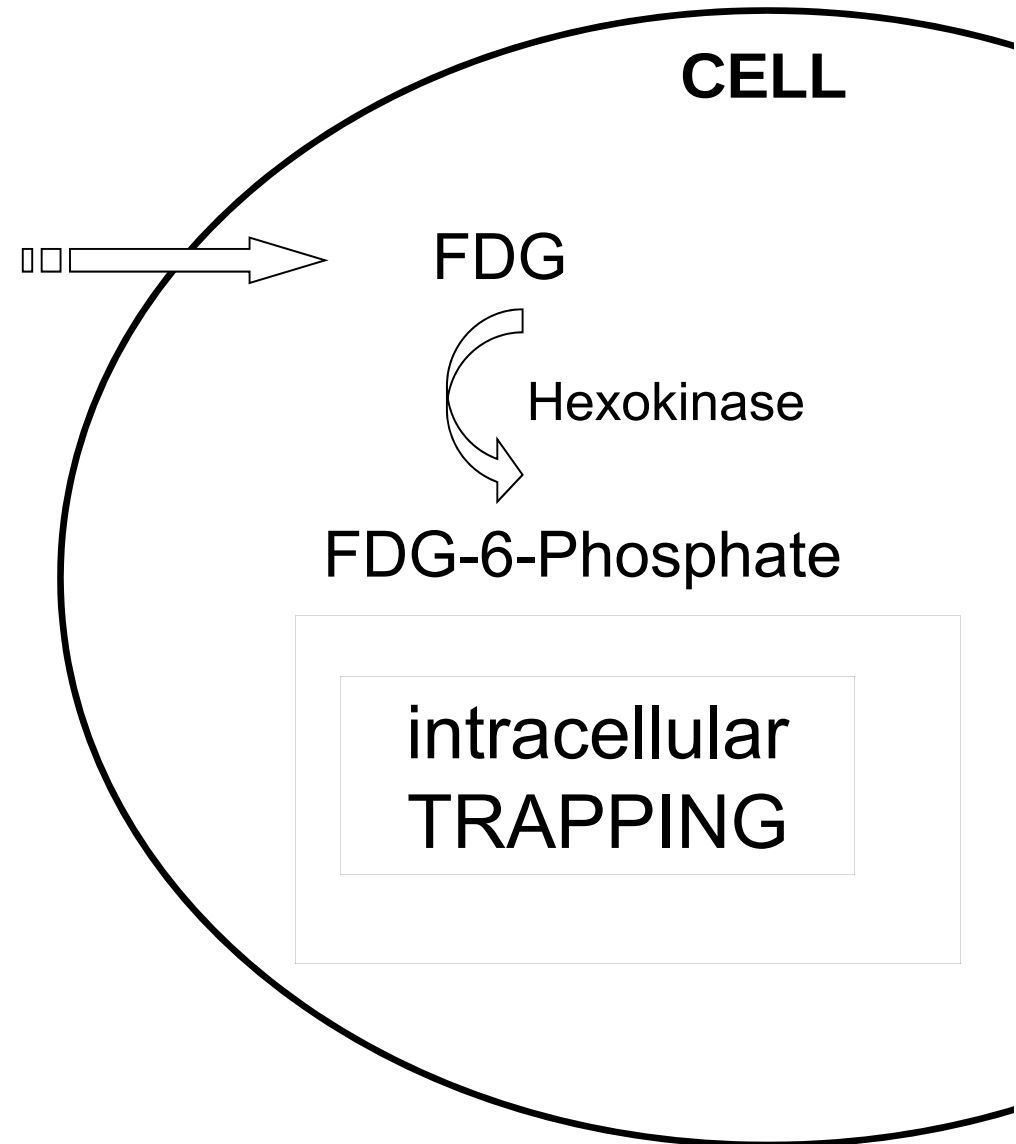
Vitalitätsdiagnostik mit FDG-PET



Vitalitätsdiagnostik mit FDG-PET



- ➡ Glucose transport
- ➡ Hexokinase activity

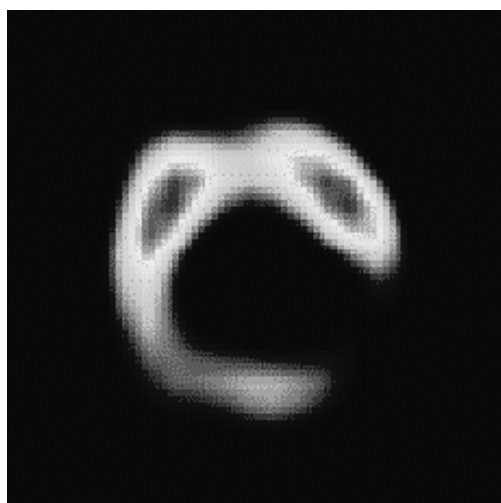


Fallbeispiel #5

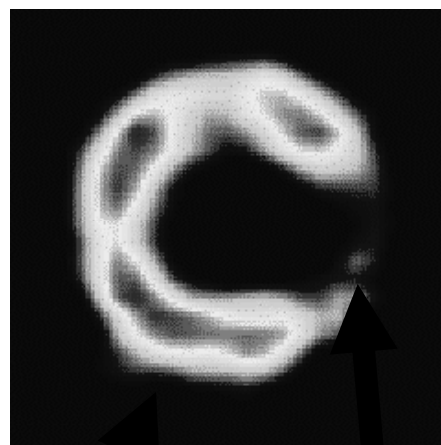
- 3-Gefäß-KHK
- RIVA 90%, RCX 90 %, RCA 70 %
- Vitalität vor Revaskularisation ?

Patient N.W.

^{99m}Tc -Tetrofosmin
SPECT



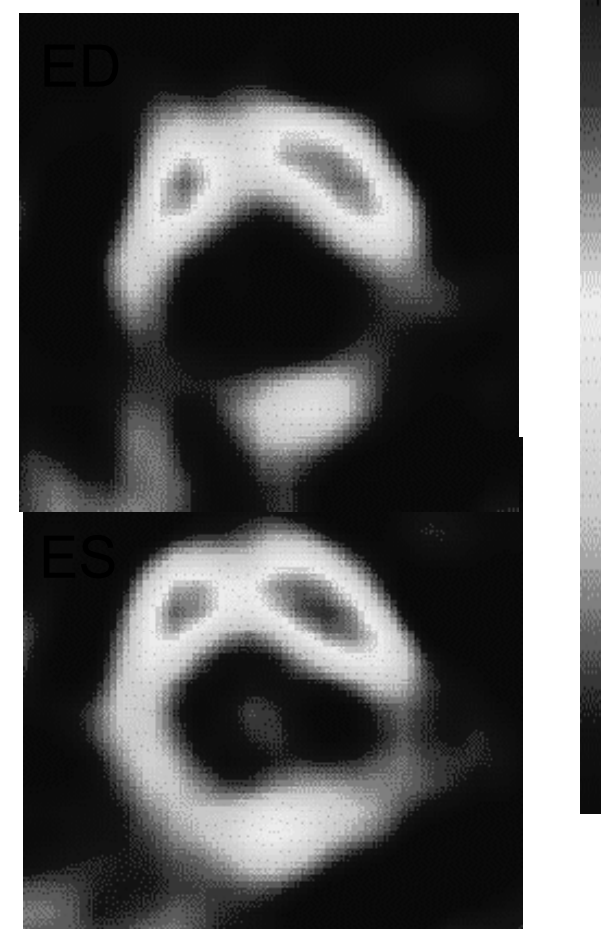
^{18}F -FDG
PET



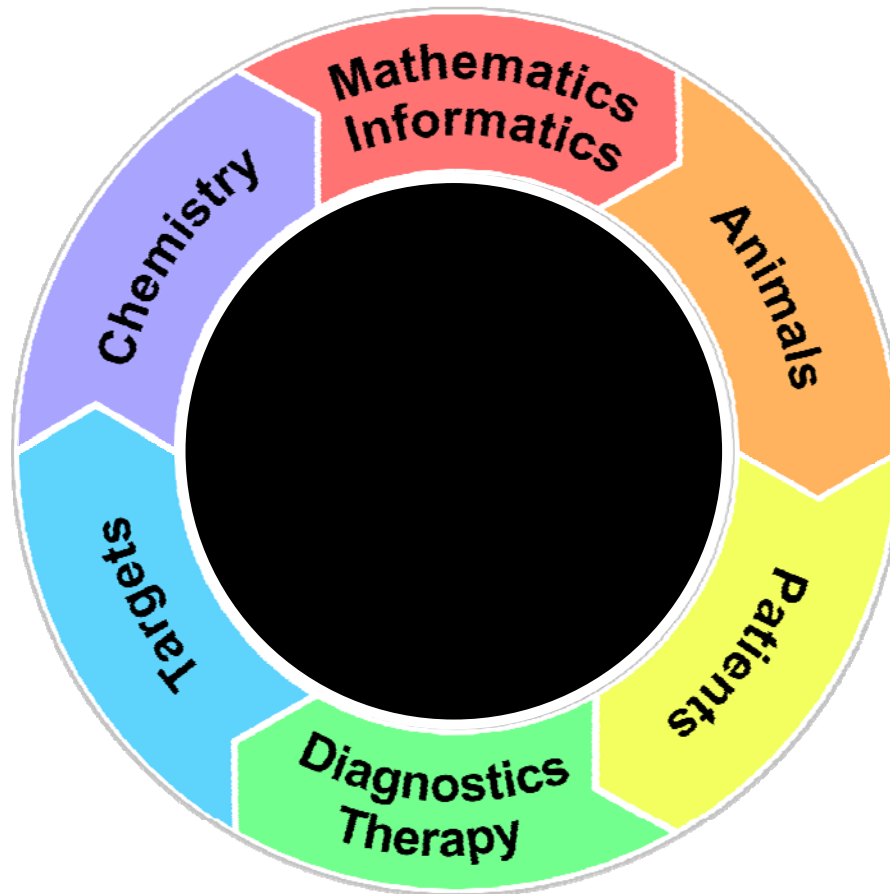
Vitalität

Narbe

^{99m}Tc -Tetrofosmin
GSPECT



Von der Präklinik in die Klinik ...



Sonderforschungsbereich 656
Molekulare kardiovaskuläre Bildgebung
www.sfbmobil.de

- Moderne Myokardszintigraphie (gated SPECT/CT)
 - Perfusion
 - Perfusionsreserve
 - Vitalität
 - Volumina
 - Kontraktion
 - Calcium-Score

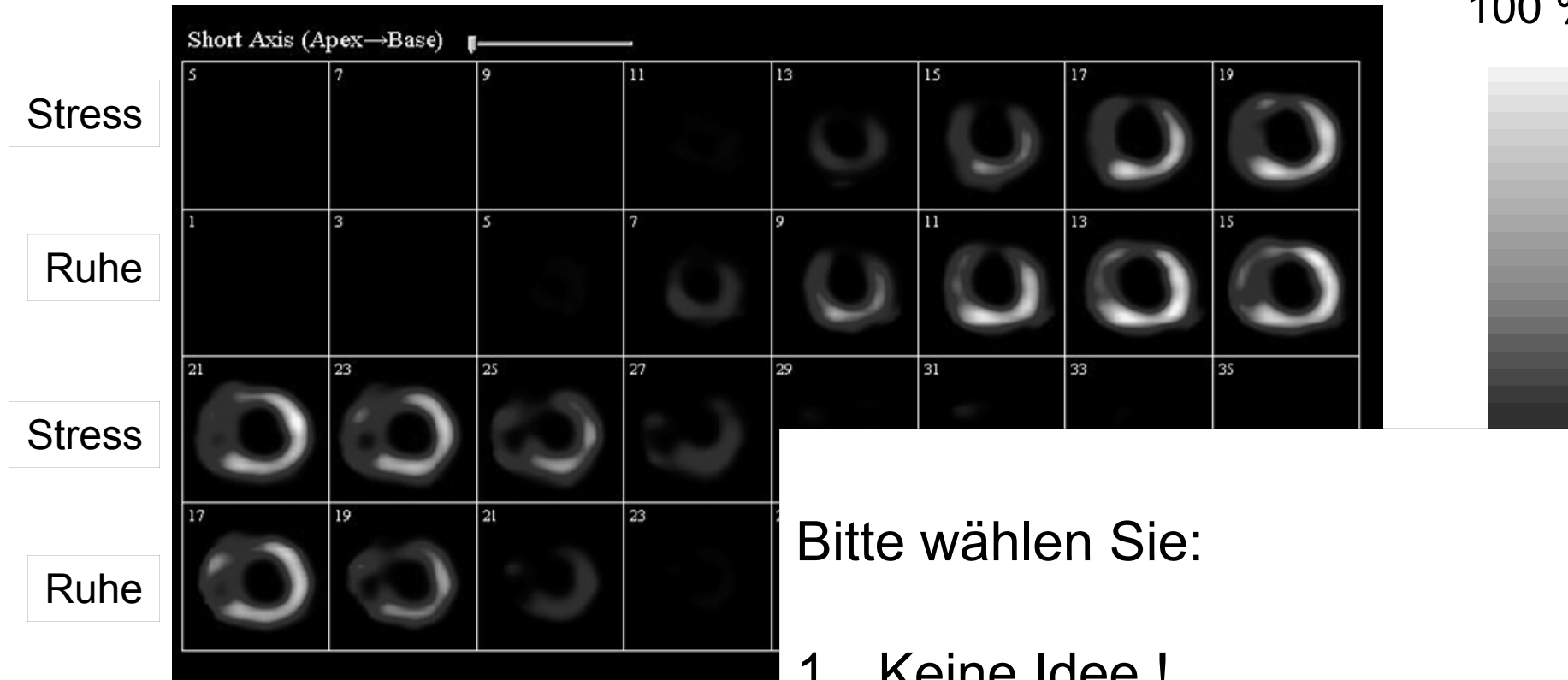
- ... Homepage der Nuklearmedizin
 - <http://nukmed.klinikum.uni-muenster.de>
 - Reiter „Lehre“

Fallbeispiel #6: Knobelei

- Patient männlich, 54 Jahre
- 1-Gefäß-KHK, LV-Funktion deutlich gestört
- ICD, COPD
- Was ist hier los ?

Fallbeispiel #6: Was ist das Auffälligste ?

100 %

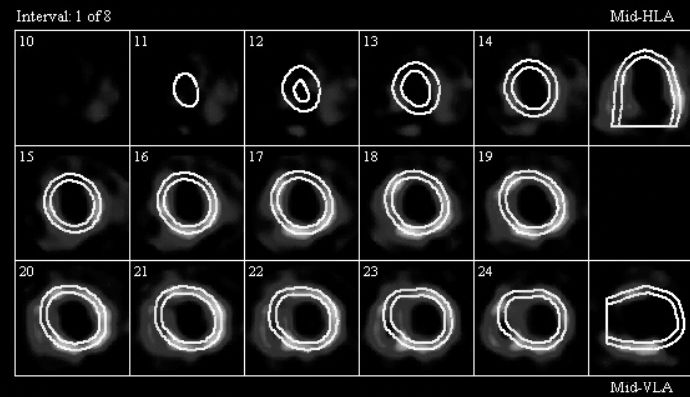
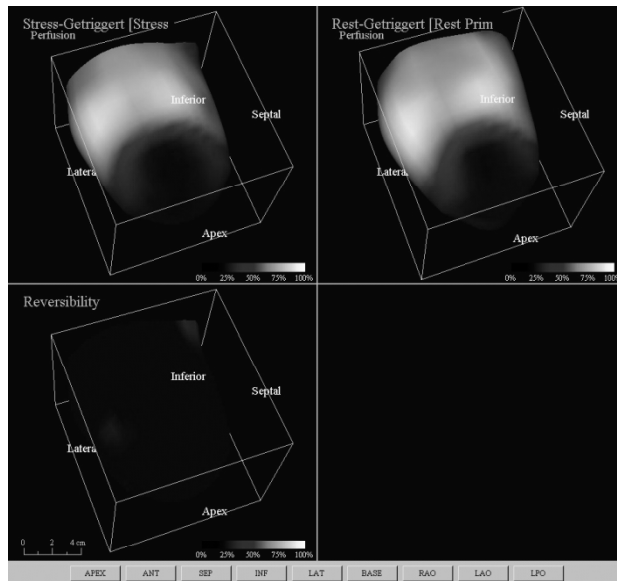


Bitte wählen Sie:

1. Keine Idee !
2. Septaler Infarkt
3. Rechtsherzhypertrophie
4. Globale Ischämie

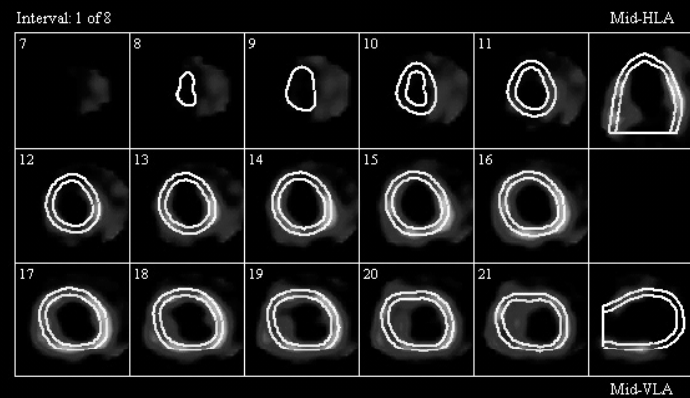
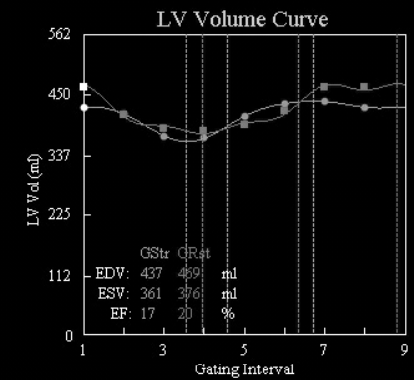
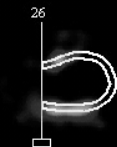
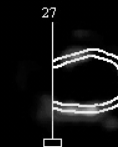
Se

Fallbeispiel #6: Knochelei



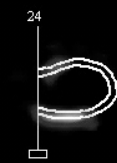
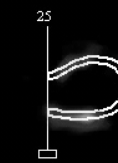
ED VLA Slice
(Interval: 7)

ES VLA Slice
(Interval: 4)



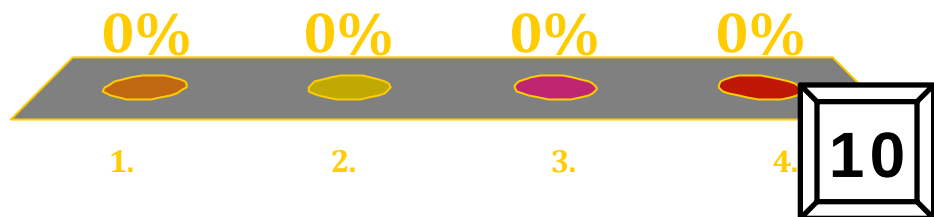
ED VLA Slice
(Interval: 1)

ES VLA Slice
(Interval: 4)



Was ist das Auffälligste ?

1. Keine Idee !
2. Septaler Infarkt
3. Rechtsherz-
hypertrophie
4. Globale Ischämie

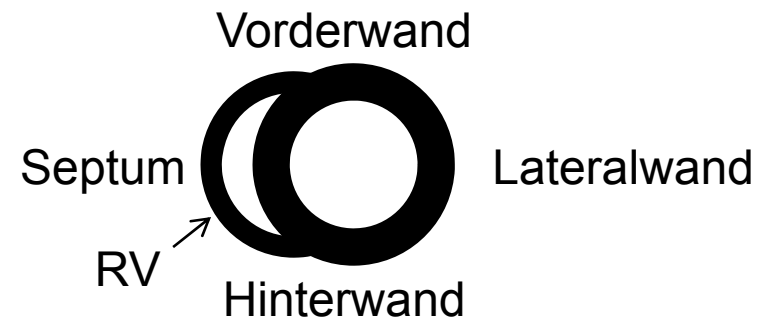
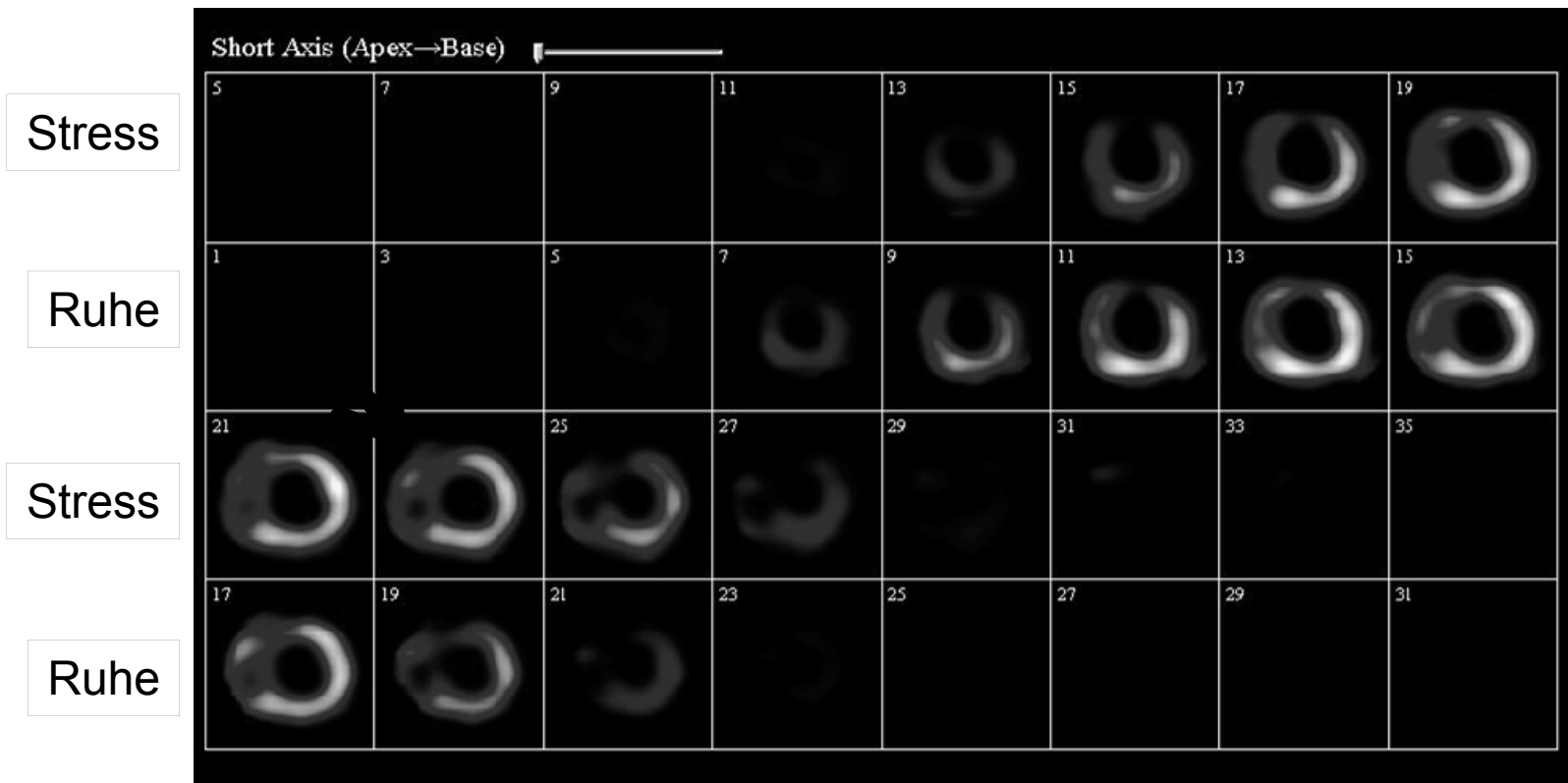


Fallbeispiel #6: Rechtsherzhypertrophie

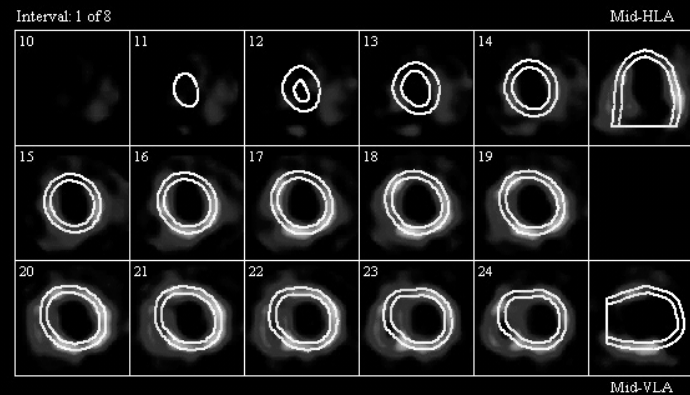
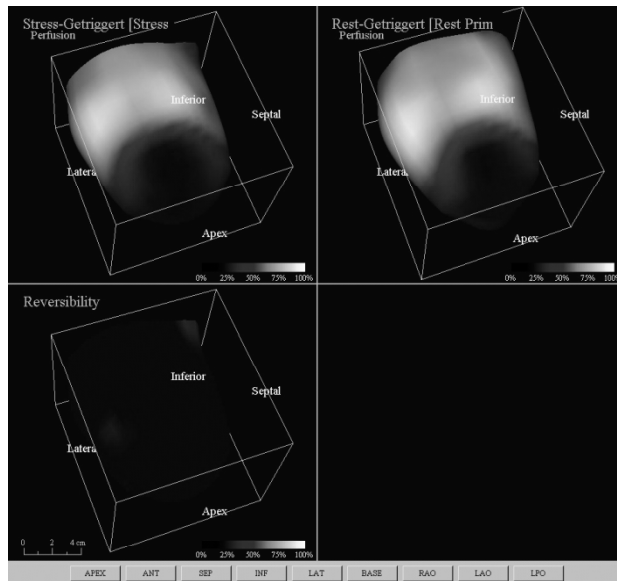
100 %



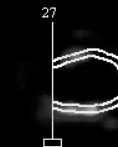
0 %



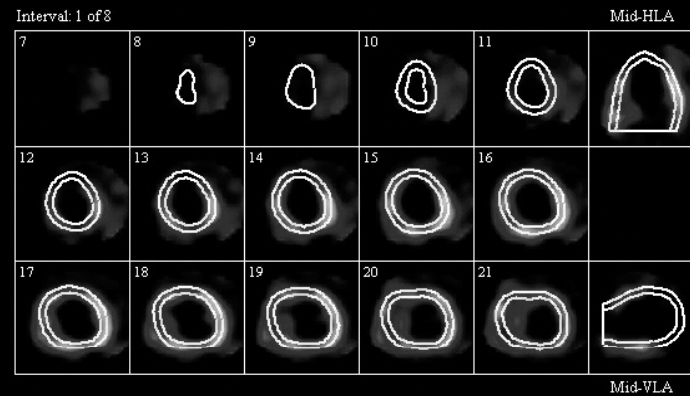
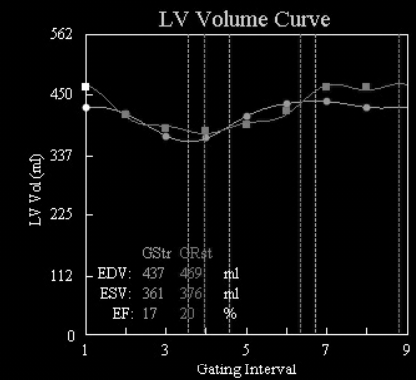
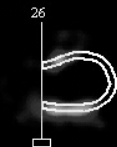
Fallbeispiel #6: Konturfindung inkorrekt



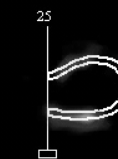
ED VLA Slice
(Interval: 7)



ES VLA Slice
(Interval: 4)



ED VLA Slice
(Interval: 1)



ES VLA Slice
(Interval: 4)

