Nuklearmedizinische Vorlesung

Herz / Kreislauf II

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Klinik und Poliklinik für Nuklearmedizin

Universitätsklinikum Münster

Diagnostik Herz-/Kreislauf

UKM

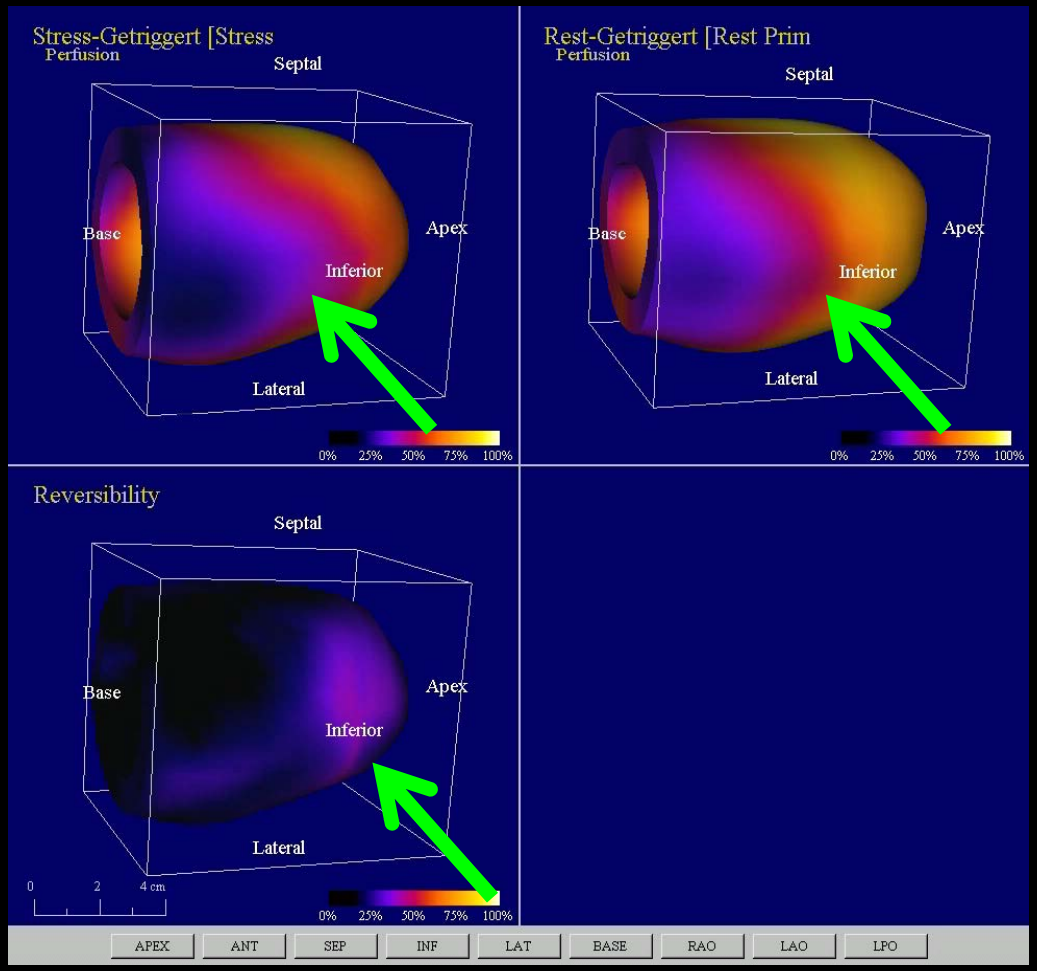
- Rationale
- Prinzipien, Technik
  - Perfusion
  - Perfusionsreserve
  - Kontraktion
  - Vitalität
- Fallbeispiele
- Prognoseabschätzung
- Multimodale Bildgebung
- Zukunft

Fallbeispiel #3: Narbe + Ischämie

Stress

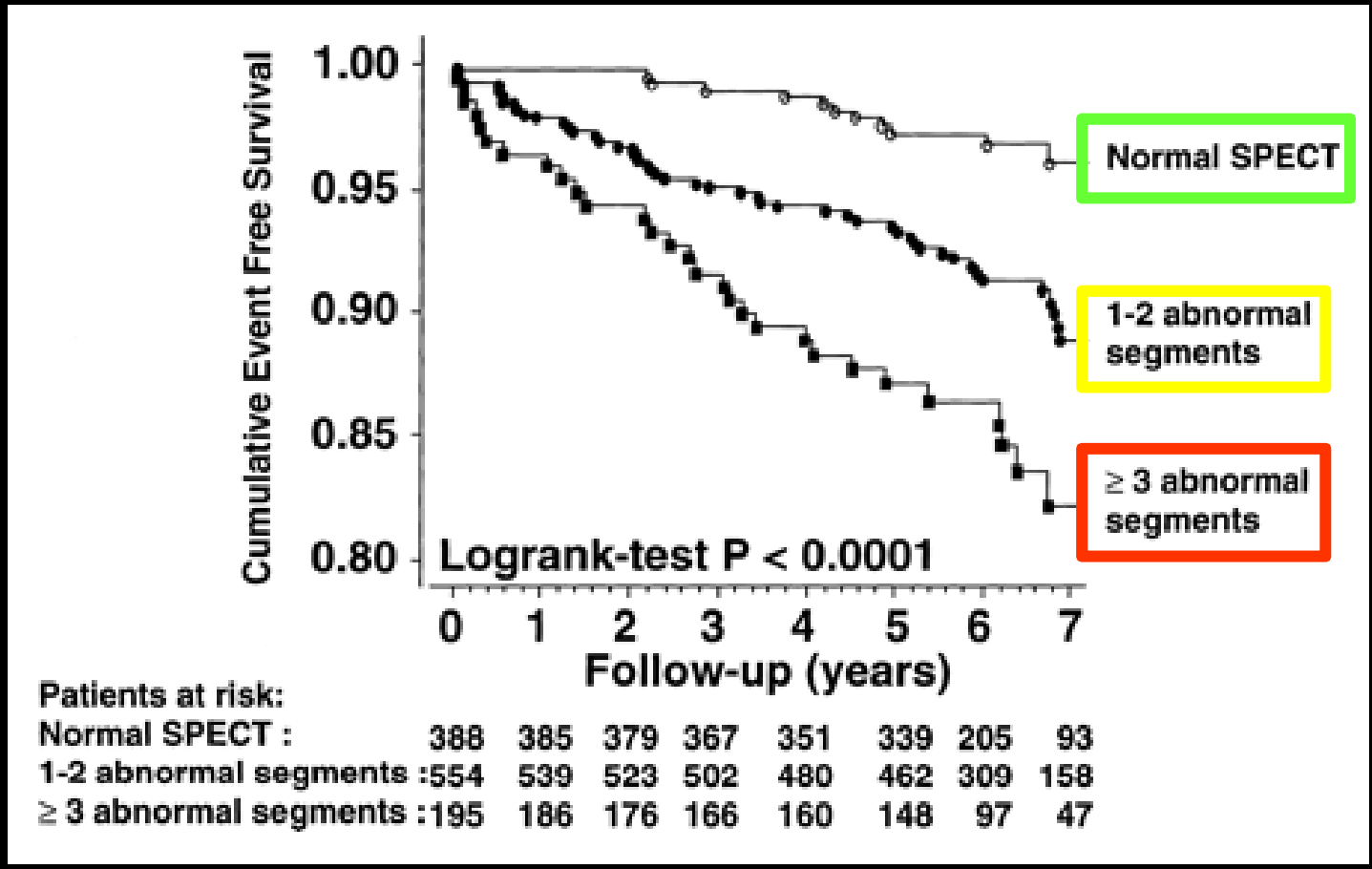
Ruhe

Δ = Ruhe - Stress



Ischämiegrad versus Risiko

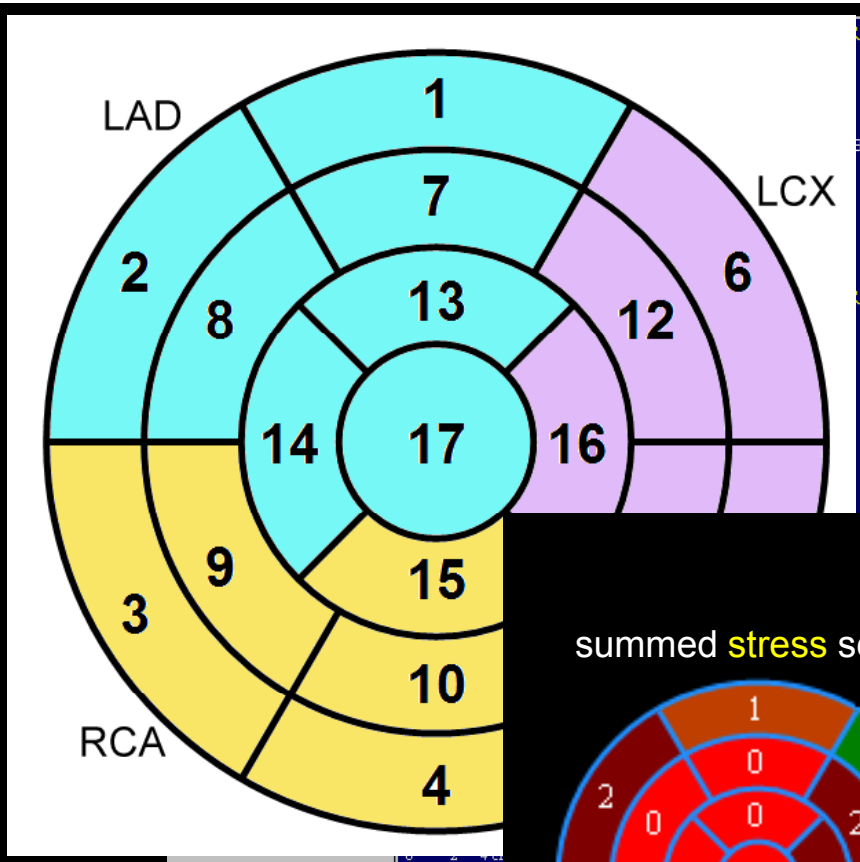
- 1137 Patienten, mittleres a-priori Risiko
- Myokard-SPECT (Thallium-201)

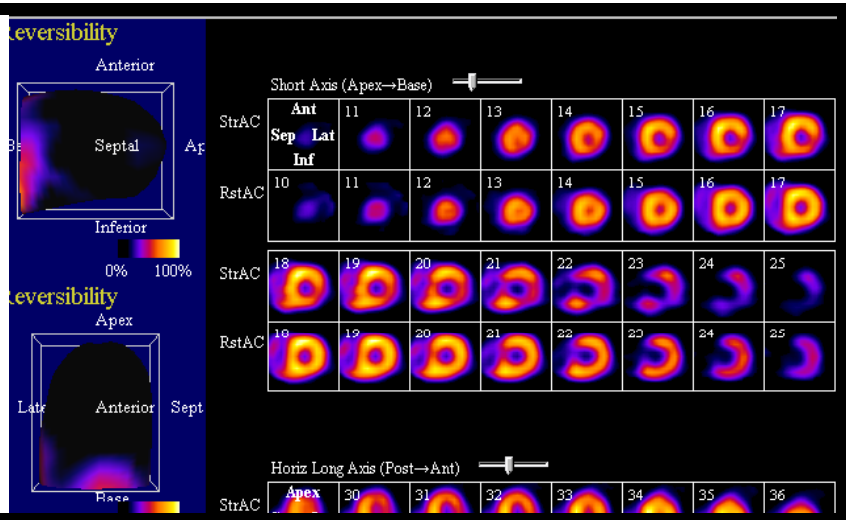


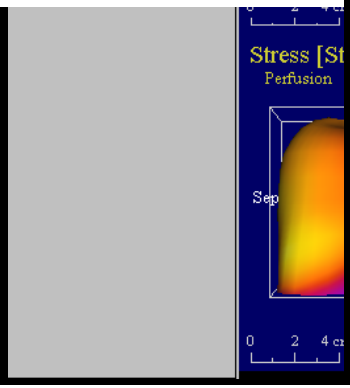
Vanzetto et al. Circulation 1999

Prognose-Scores ?

UKM





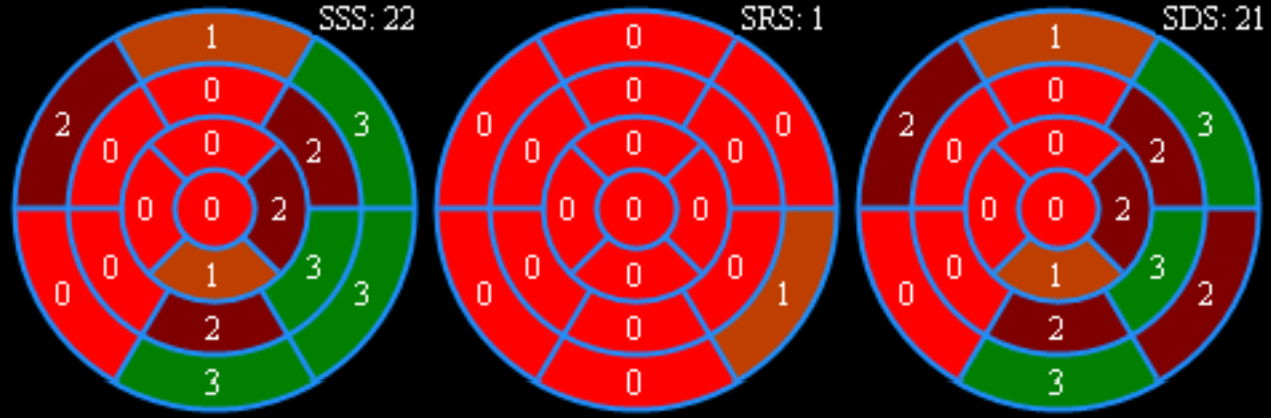


Scoring

summed stress score — SSS: 22

summed rest score — SRS: 1

summed difference score — SDS: 21

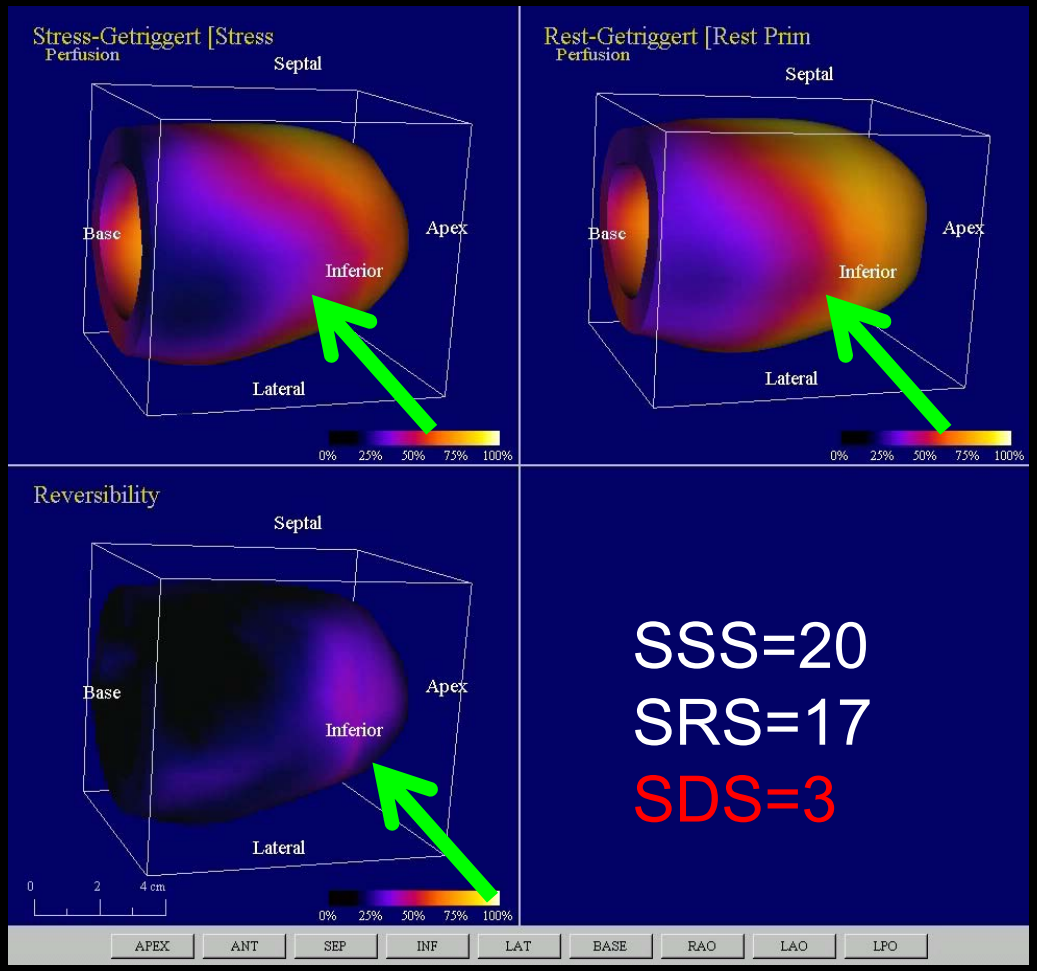


Perf: 0: Normal | 1: Equivocal | 2: Abnormal | 3: Severe | 4: Absent

Fallbeispiel #3: Narbe + Ischämie

Stress

Ruhe



Δ = Ruhe - Stress

SSS=20
SRS=17
SDS=3

Fallbeispiel #4

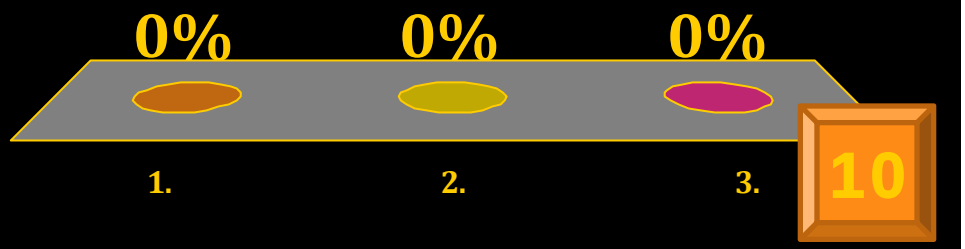
- Patient männlich, 68 Jahre
- 3-Gefäß-KHK, kein Herzinfarkt
- Keine aktuellen Beschwerden, Routinekontrolle
- Letzte Kontrolle vor 2 Jahren o.B.
- Was ist sinnvoll ?

Bitte wählen Sie:

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

Fallbeispiel #4: Befund ?

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



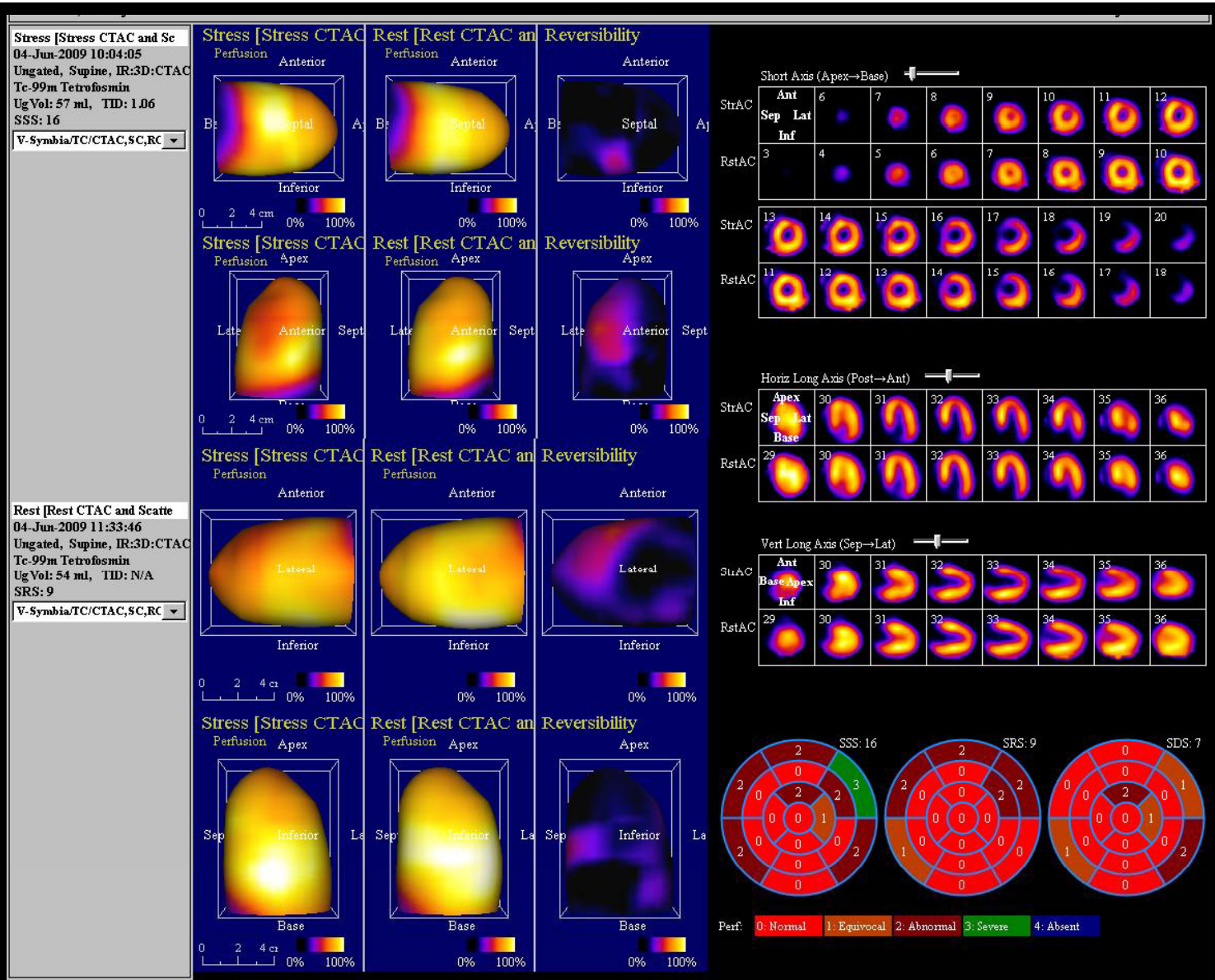
Fallbeispiel #4

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

Fallbeispiel #4

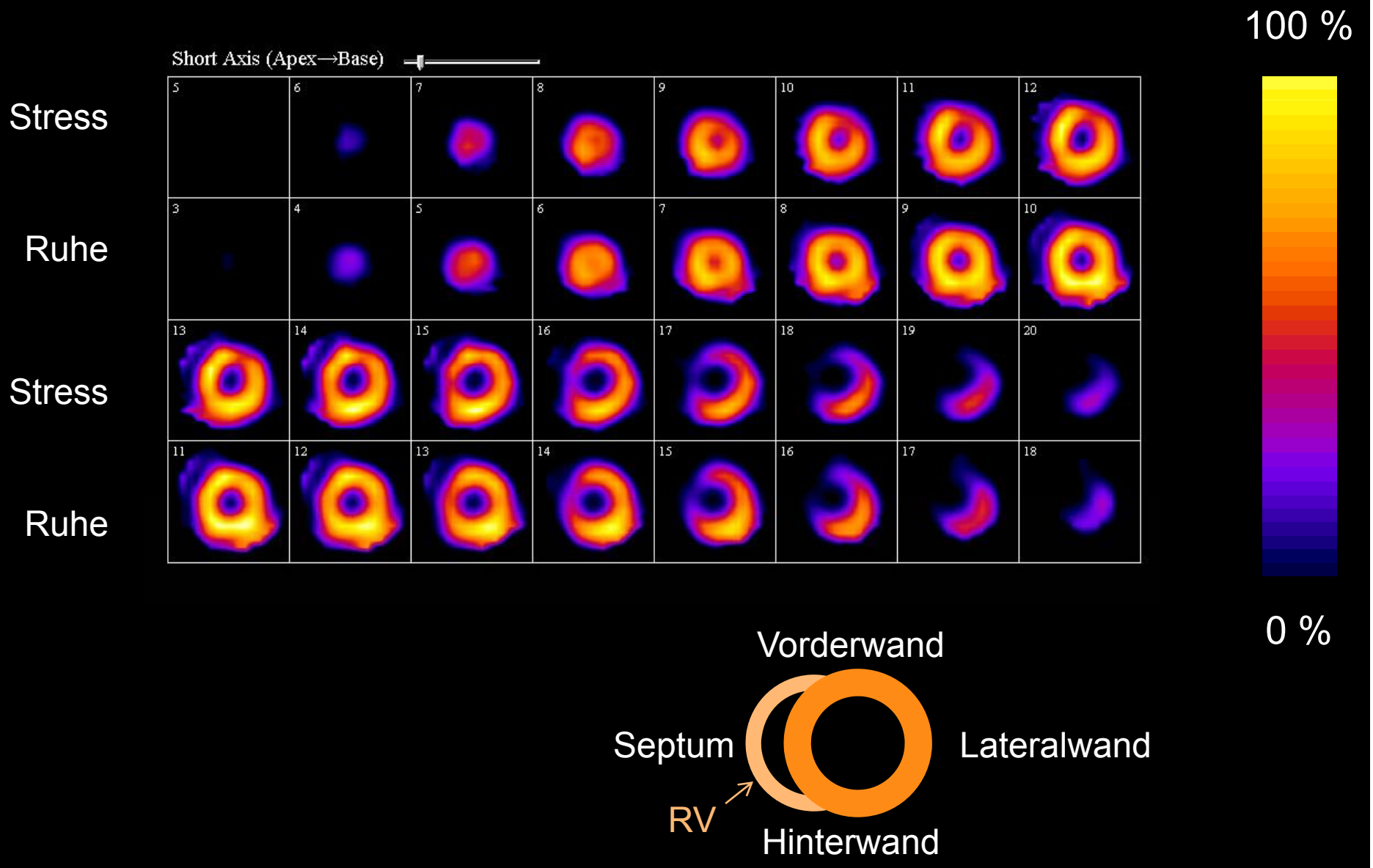
- Ergometrie
  - 2 min 50 Watt, 2 min 100 Watt , 2 min 150 Watt
  - HF Ruhe 54/min, HF Stress 140/min
  - RR Ruhe 140/70 mmHg, RR Stress 175/100 mmHg
  - EKG: asc. ST-Senkung 0.2 mV in V3-V5 (wie zuvor)

Fallbeispiel #4

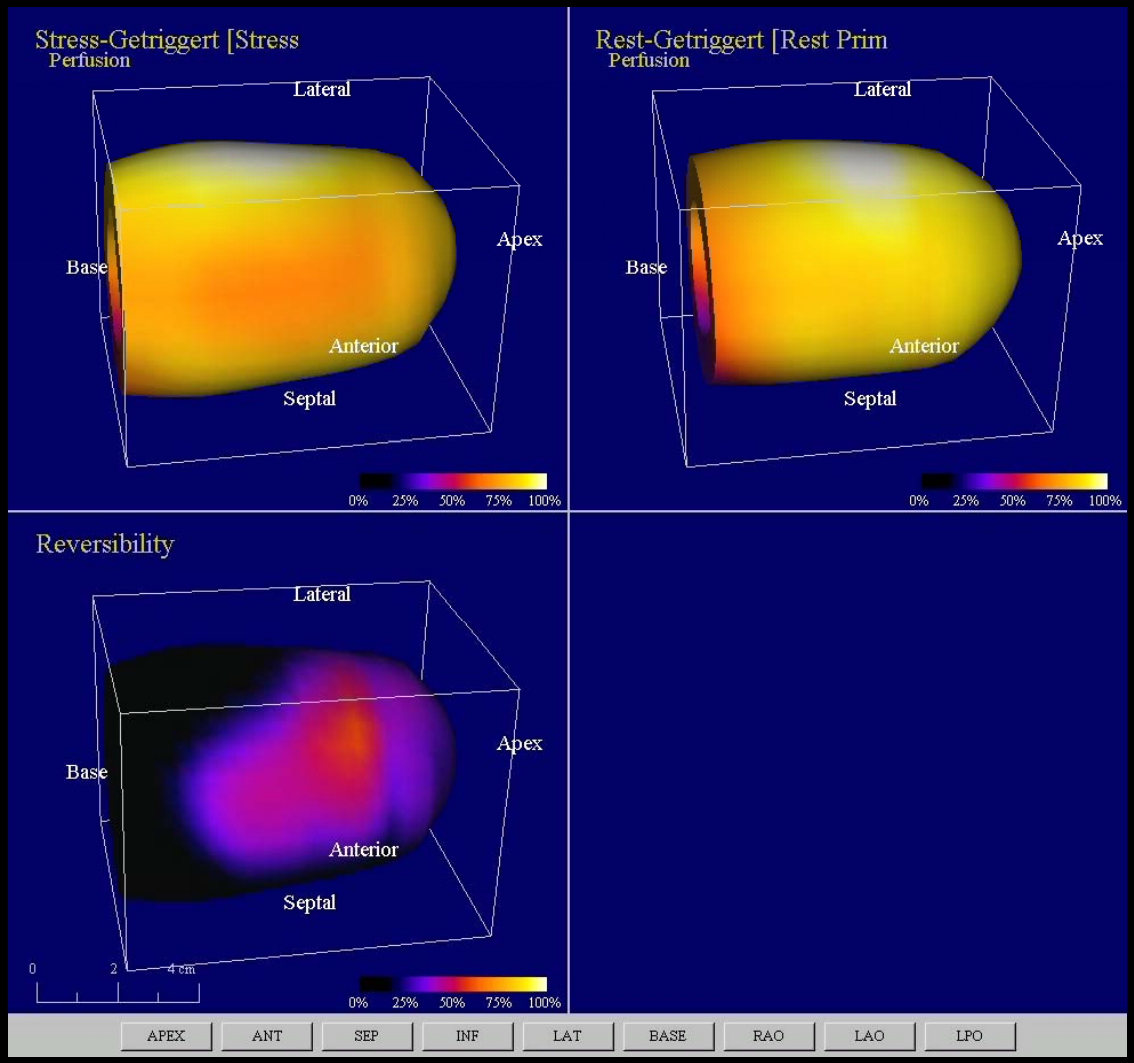


Fallbeispiel #4: Befund

UKM



Fallbeispiel #4: Befund

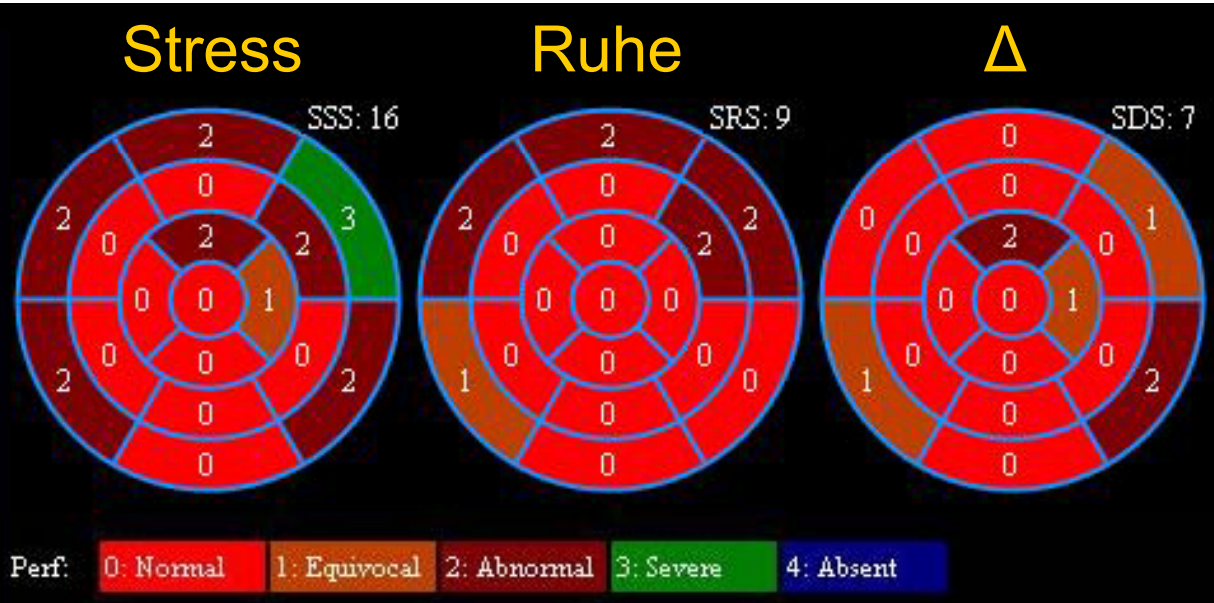


EDV: 84 ml [101-165]

ESV: 27 ml [28-64]

EF: 68 % [59-73]

Fallbeispiel #4: Befund ?

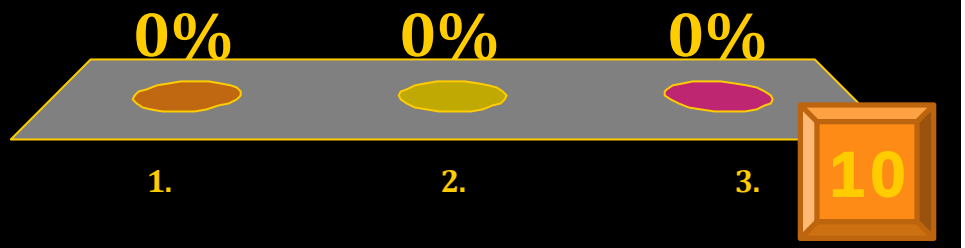


Bitte wählen Sie:

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

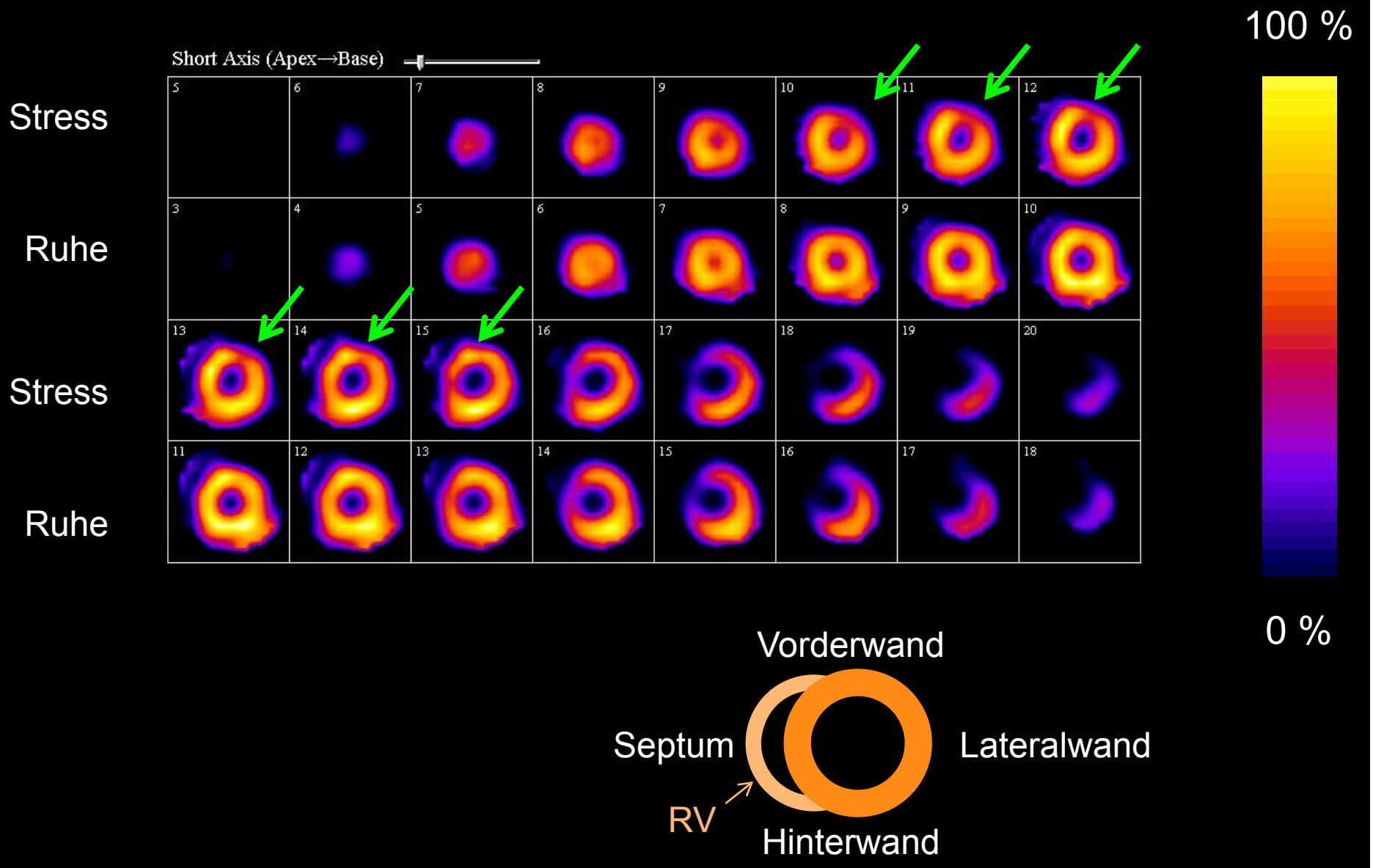
Fallbeispiel #4: Befund ?

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

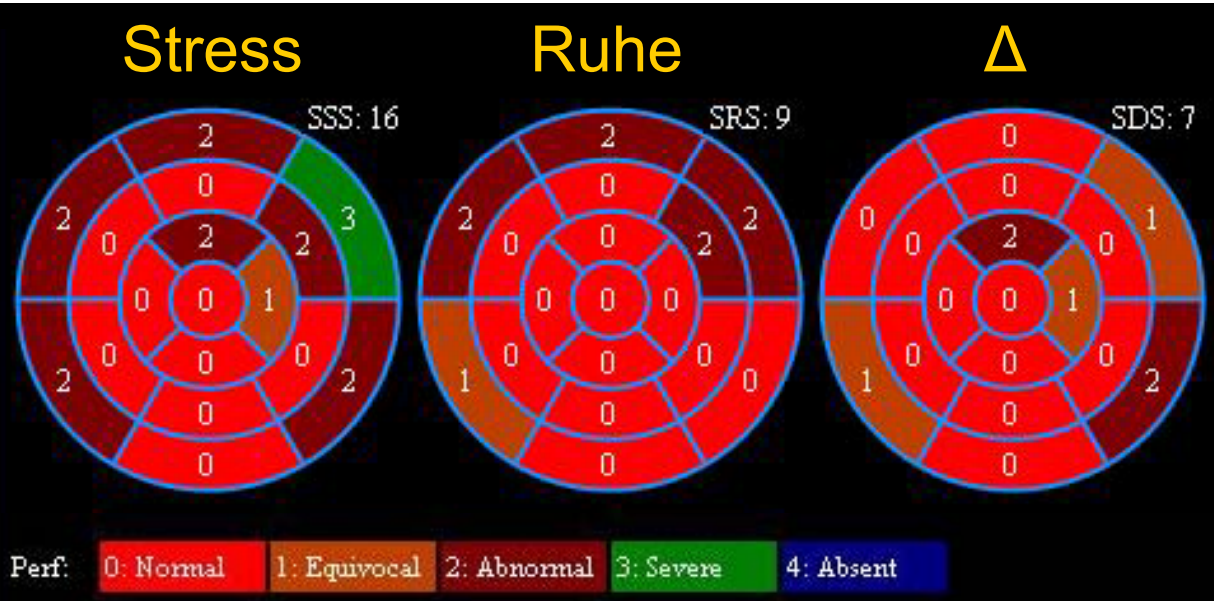


Fallbeispiel #4: Ischämie anterolateral

UKM



Fallbeispiel #4: Weiteres Procedere ?

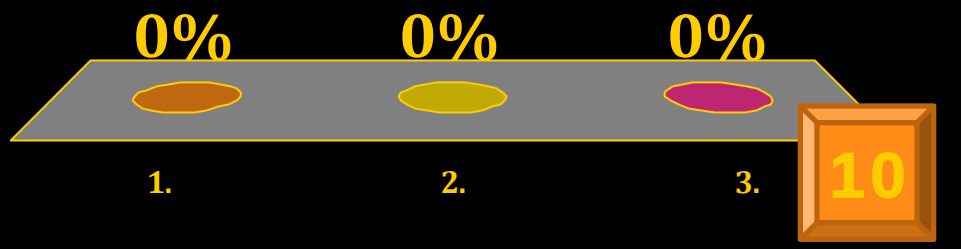


Bitte wählen Sie:

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

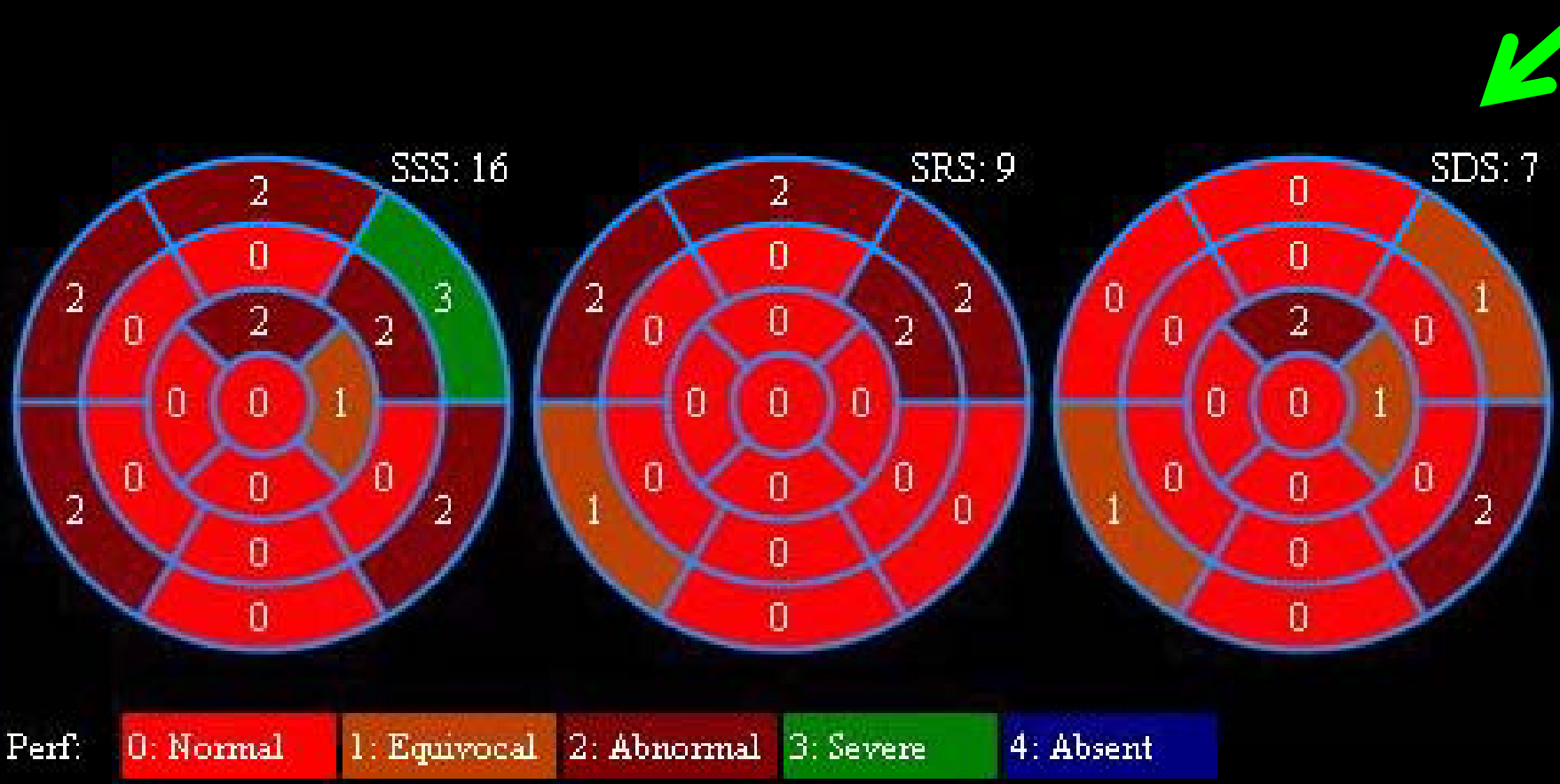
Fallbeispiel #4: Weiteres Procedere ?

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



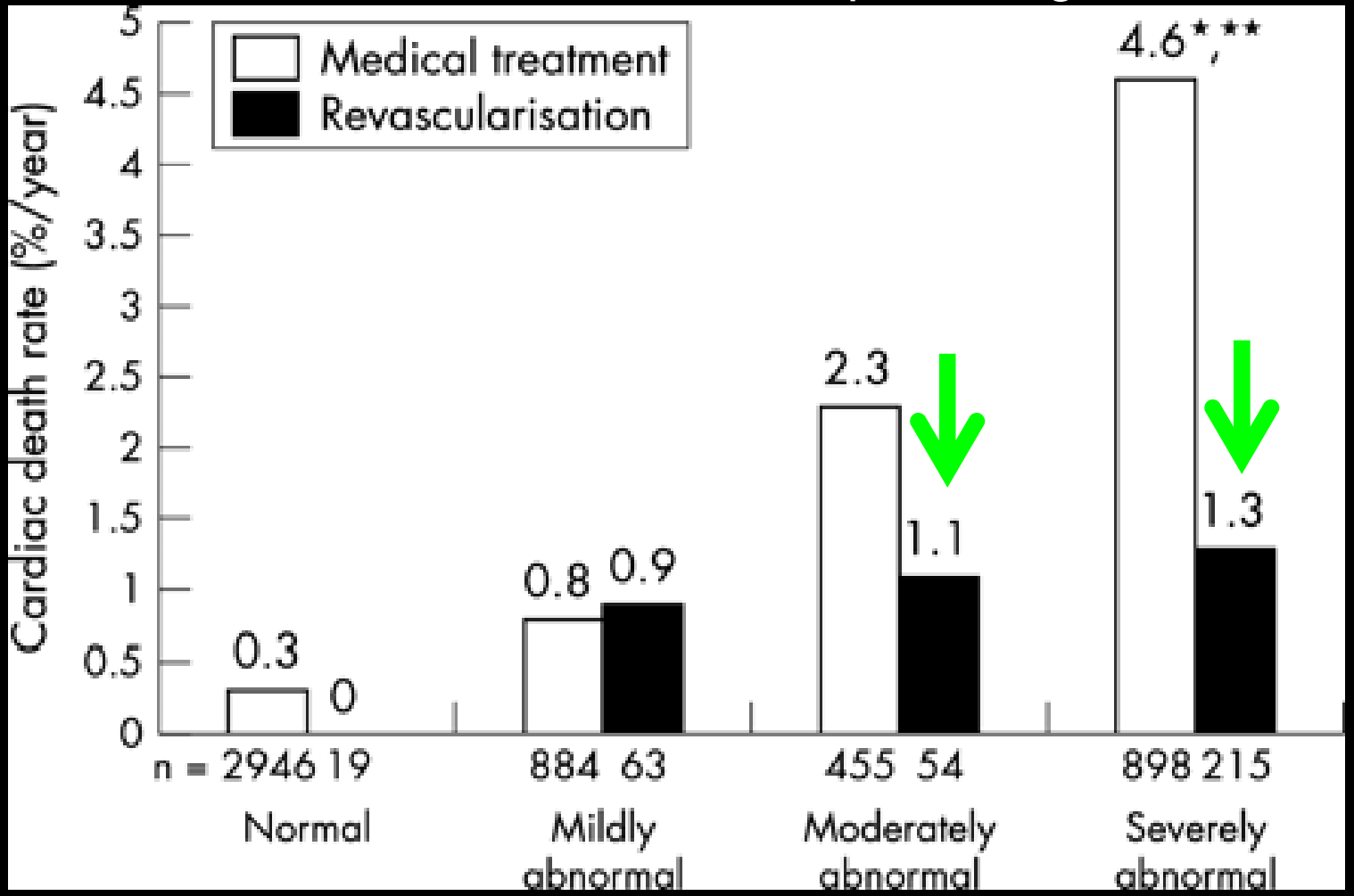
Fallbeispiel #4: Scores = Hohes Risiko

UKM



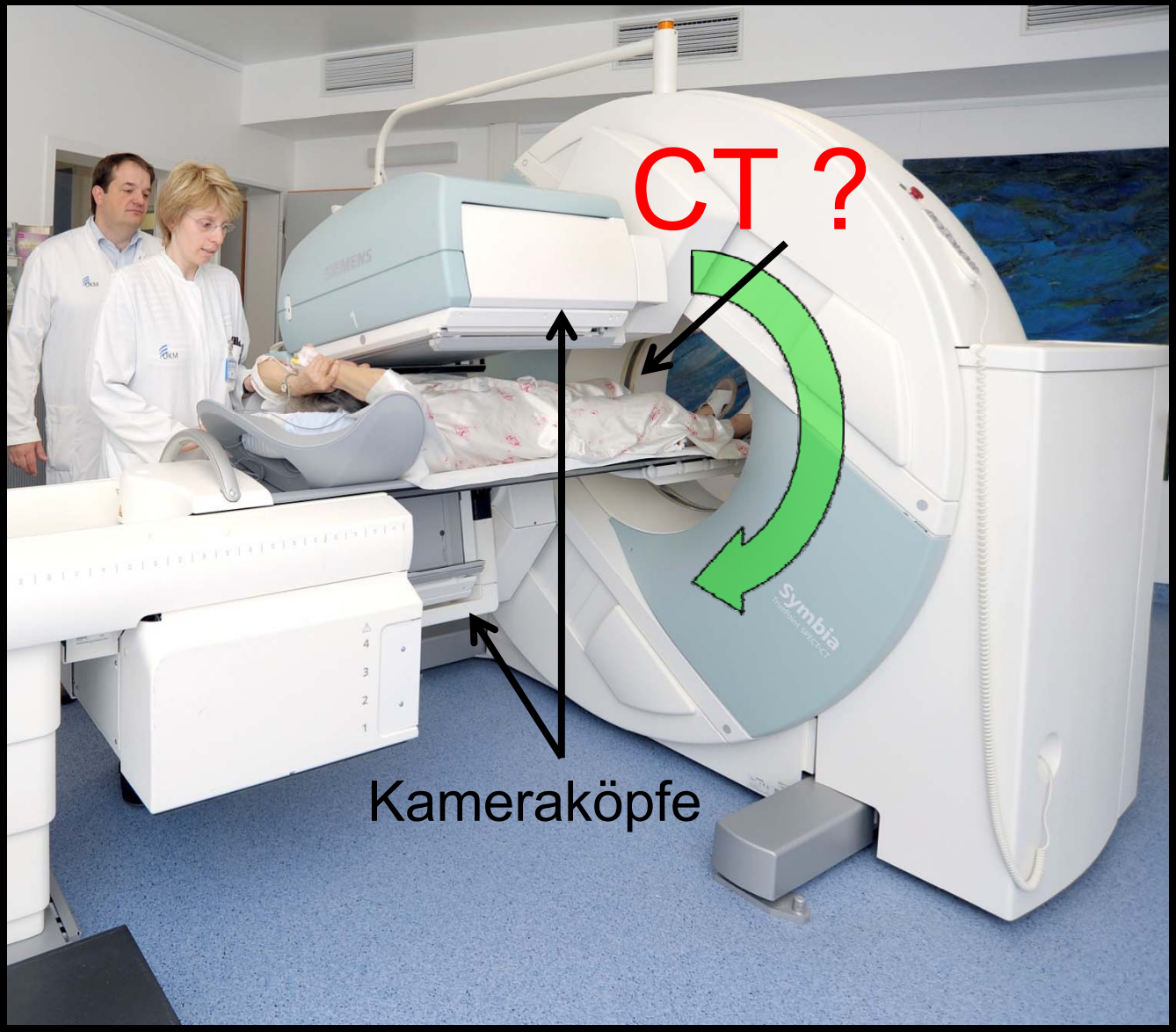
Prognose und Therapie

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



Hachamovitch Circulation 1998

SPECT/CT-Kamera - Herzbildgebung



Kardiovaskuläre Bildgebung - Modalitäten

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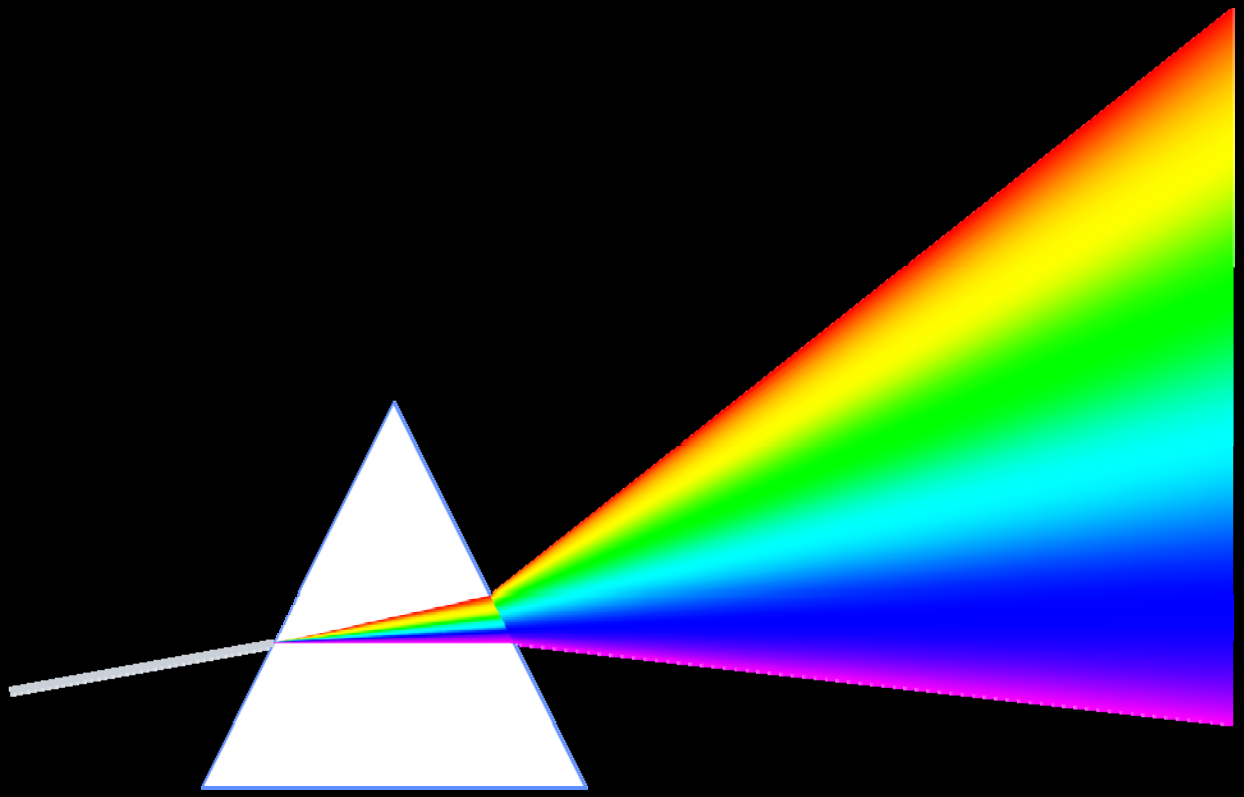
Questions ► Diagnostics ► Modalities



- X-Ray
- CT
- MRI
- Ultrasound
- Optical Imaging
- SPECT/PET

PET / CT, SPECT / CT, PET / MRT…

Morphologie & Funktion

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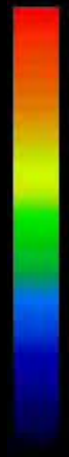
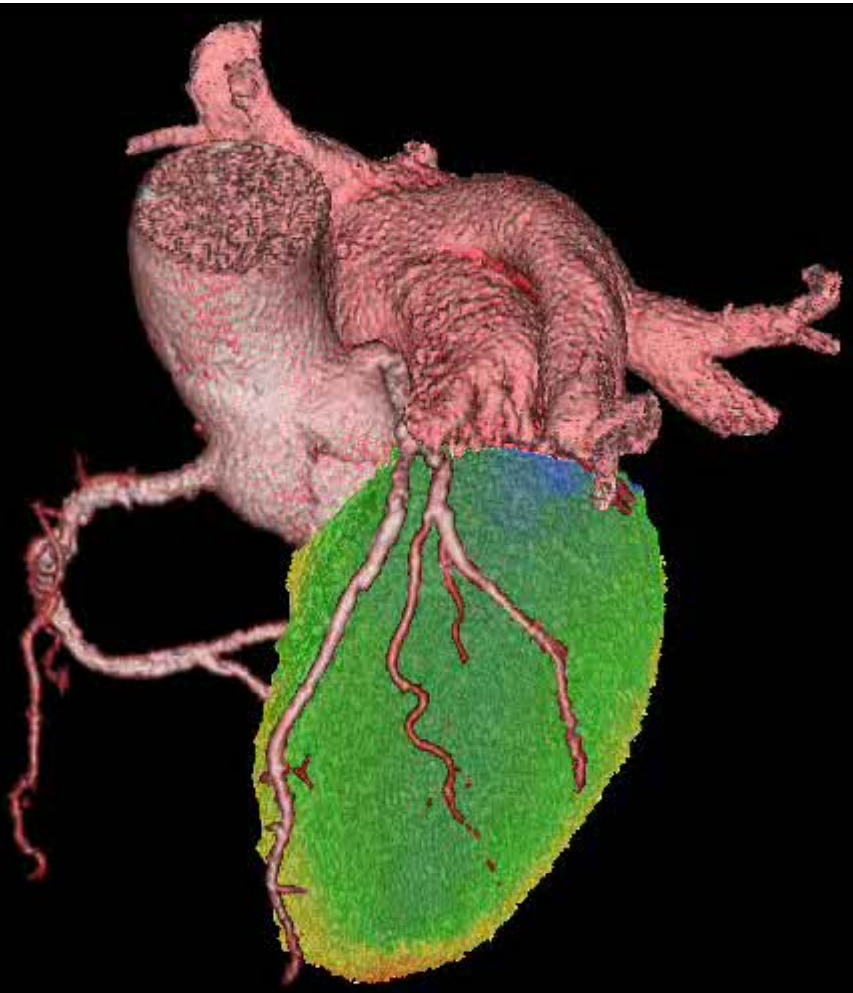
Findings CTA

- Calcifications !

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





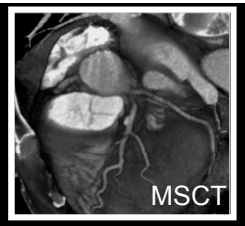
Findings PET

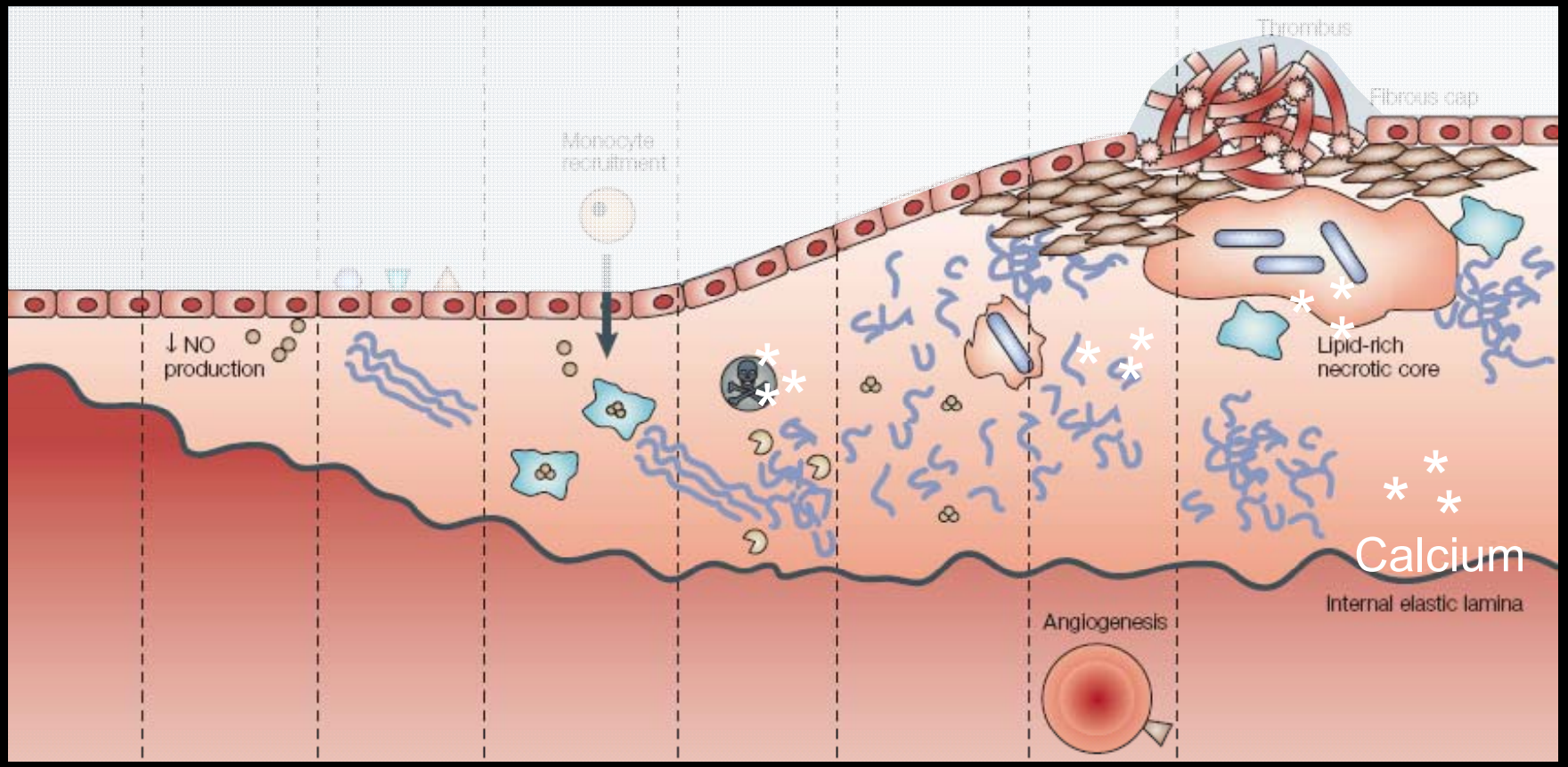
- Stress-induced ischemia anterior/lateral

Conclusion PET/CT

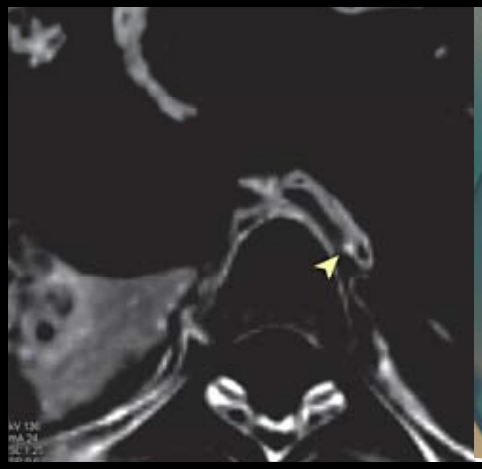
- Revascularization

Kalk in der Gefäßwand …





Bildgebung der Arteriosklerose - Calcium



heute

Ägypten vor 3000 Jahren !

Allam AH et al. JAMA 2009

Calcium-Score – Kardiovaskuläres Risiko

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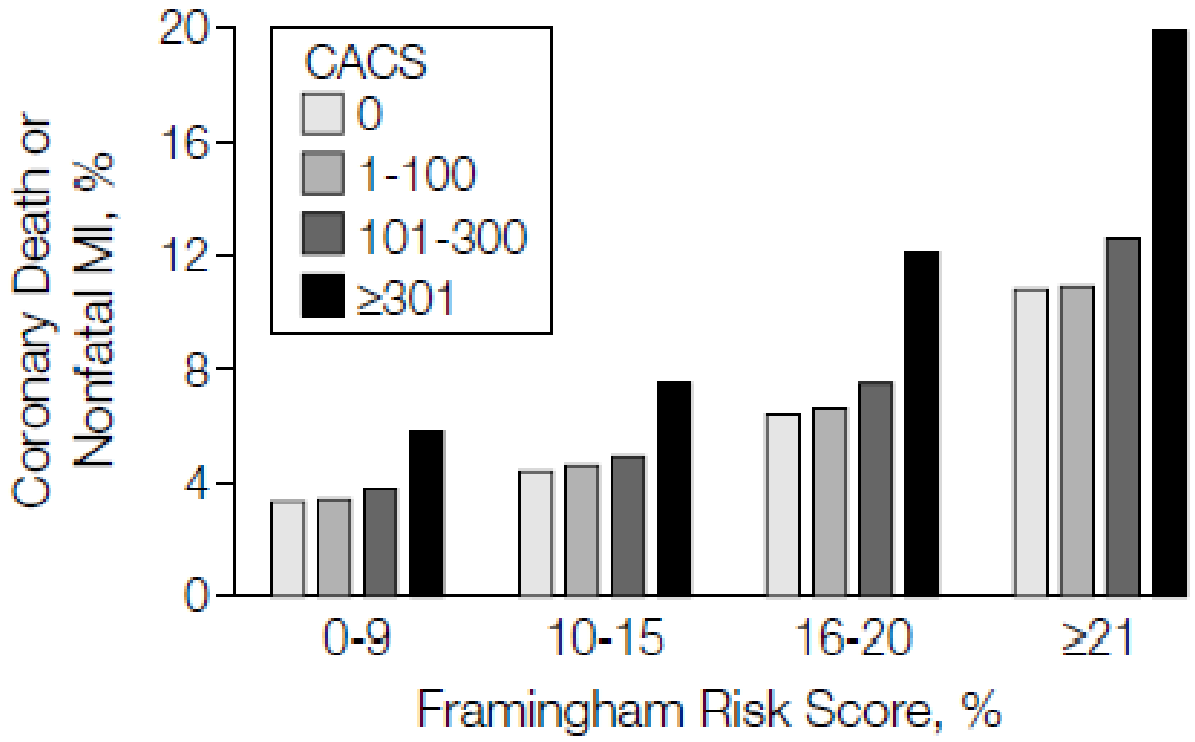
Figure 1. Predicted 7-Year Event Rates From COX Regression Model for CHD Death or Nonfatal Myocardial Infarction for Categories of FRS or CACS

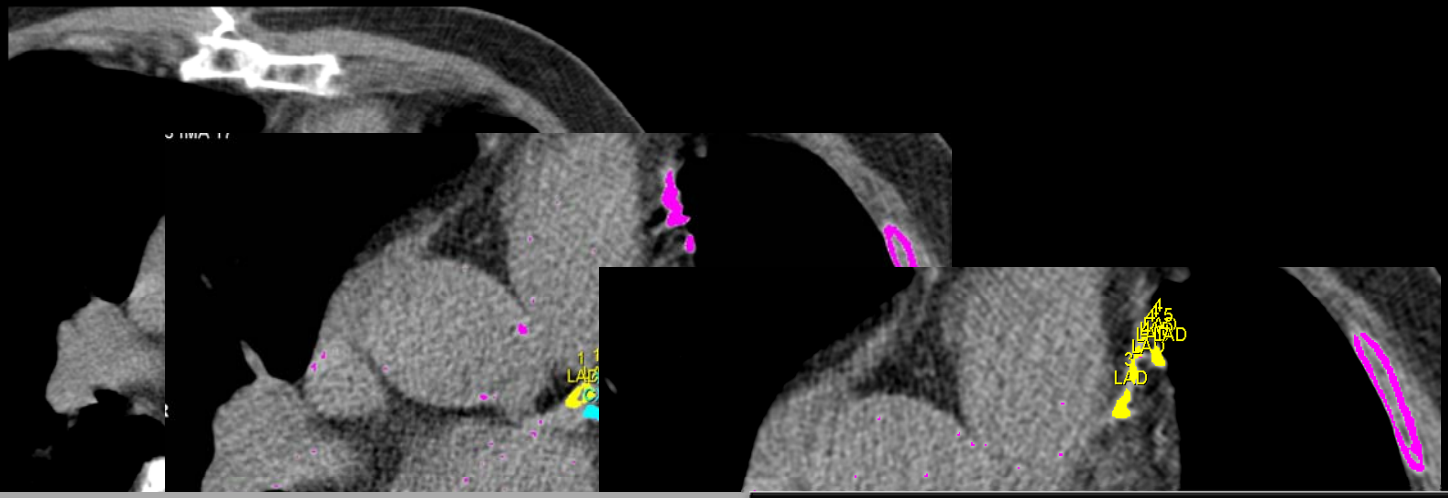


Greenland et al. JAMA 2005

Fallbeispiel #5

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

Fallbeispiel #5: Calcium-Score



Bitte wählen Sie:

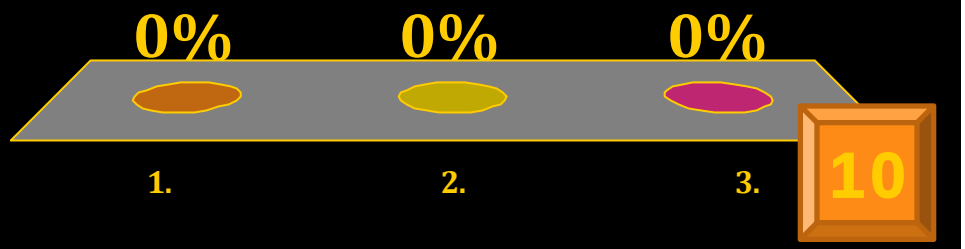
1. Belastungsinduzierte Ischämie Vorderwand
2. Belastungsinduzierte Ischämie Lateralwand
3. Keine Ischämie

Schwellenwert = 130 HU
(97.5 mg/cm³ CaHA)

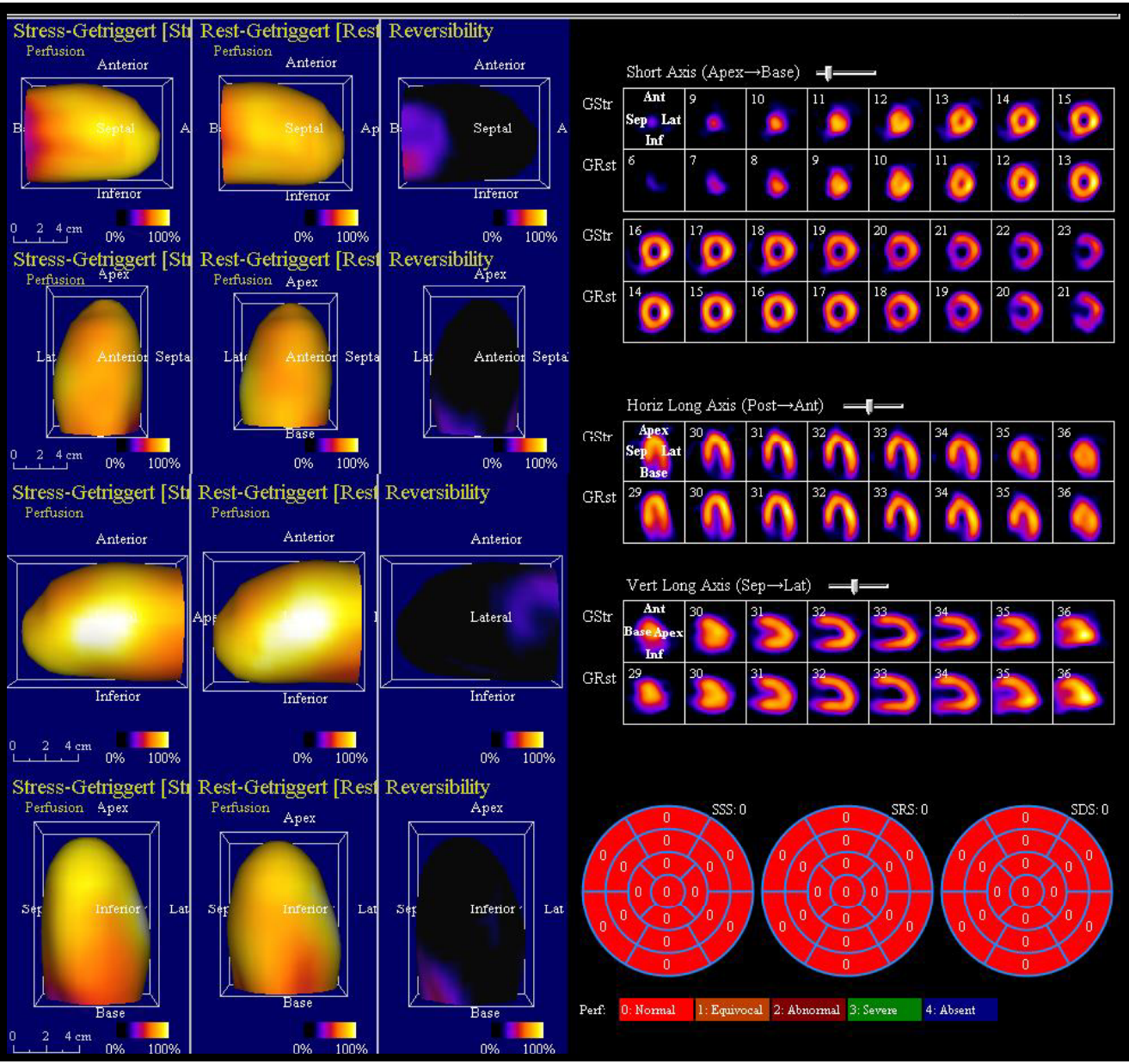
Arterie	Anzahl von Läsionen (1)	Volumen [mm³] (3)	Äquiv. Masse [mg CaHA] (4)	Ergebnis (2)
LM	0	0.0	0.00	0.0
LAD	3	454.0	103.70	618.8
CX	1	41.2	7.95	52.2
RCA	9	183.7	41.29	284.8
Gesamt	13	678.9	152.94	955.8

Fallbeispiel #5: Perfusion ?

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

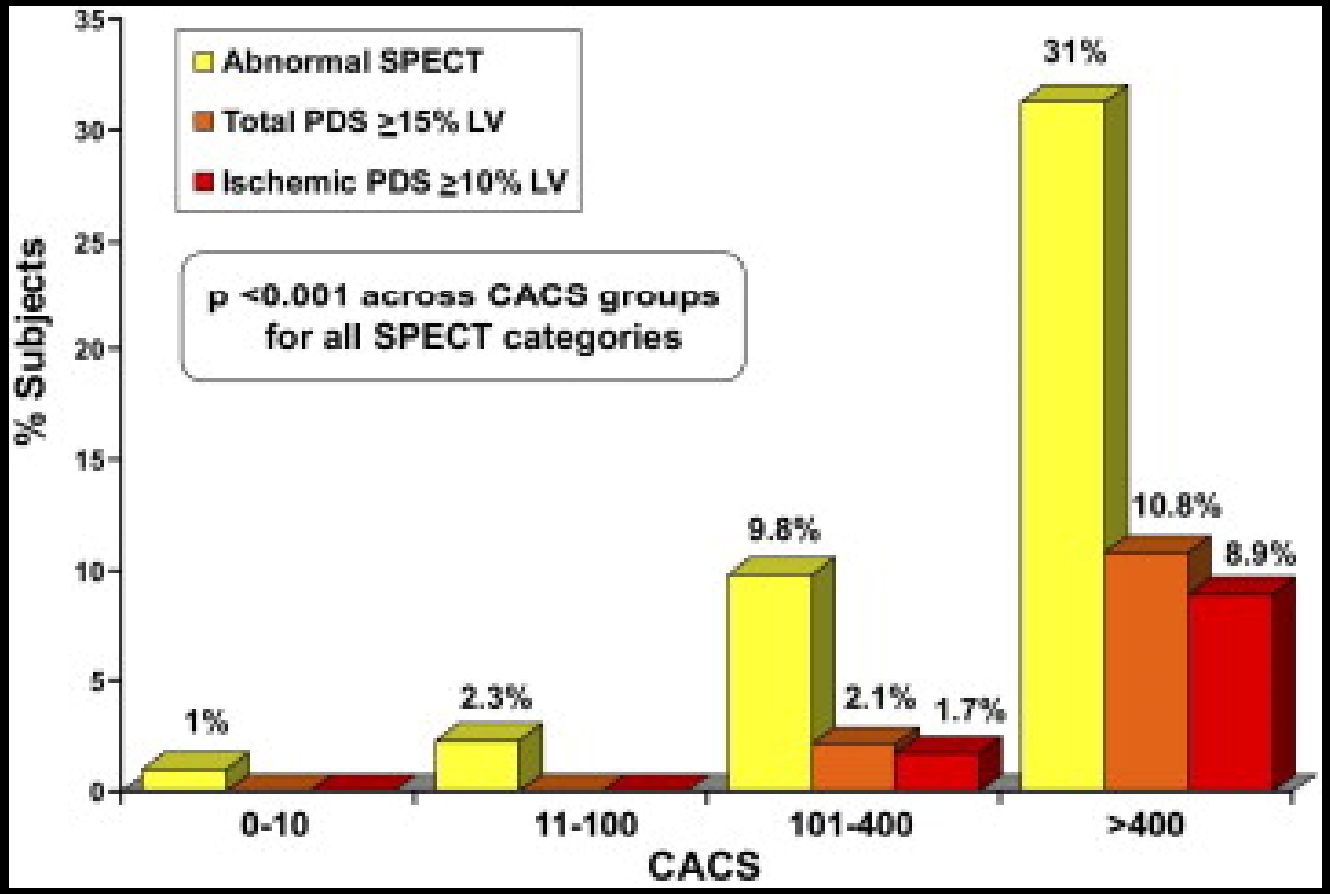


Fallbeispiel #5: Unauffällige Perfusion



Calcium Score - Perfusion

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



Chang SM, JACC 2009

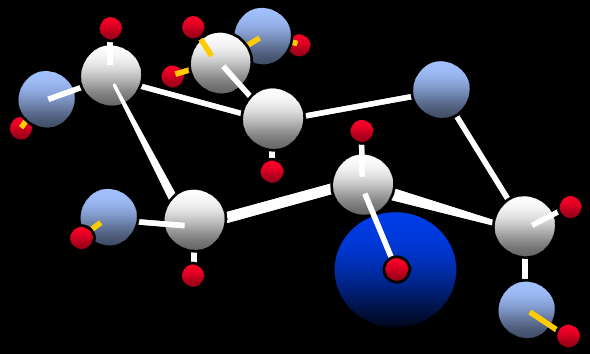
Myokardszintigraphie

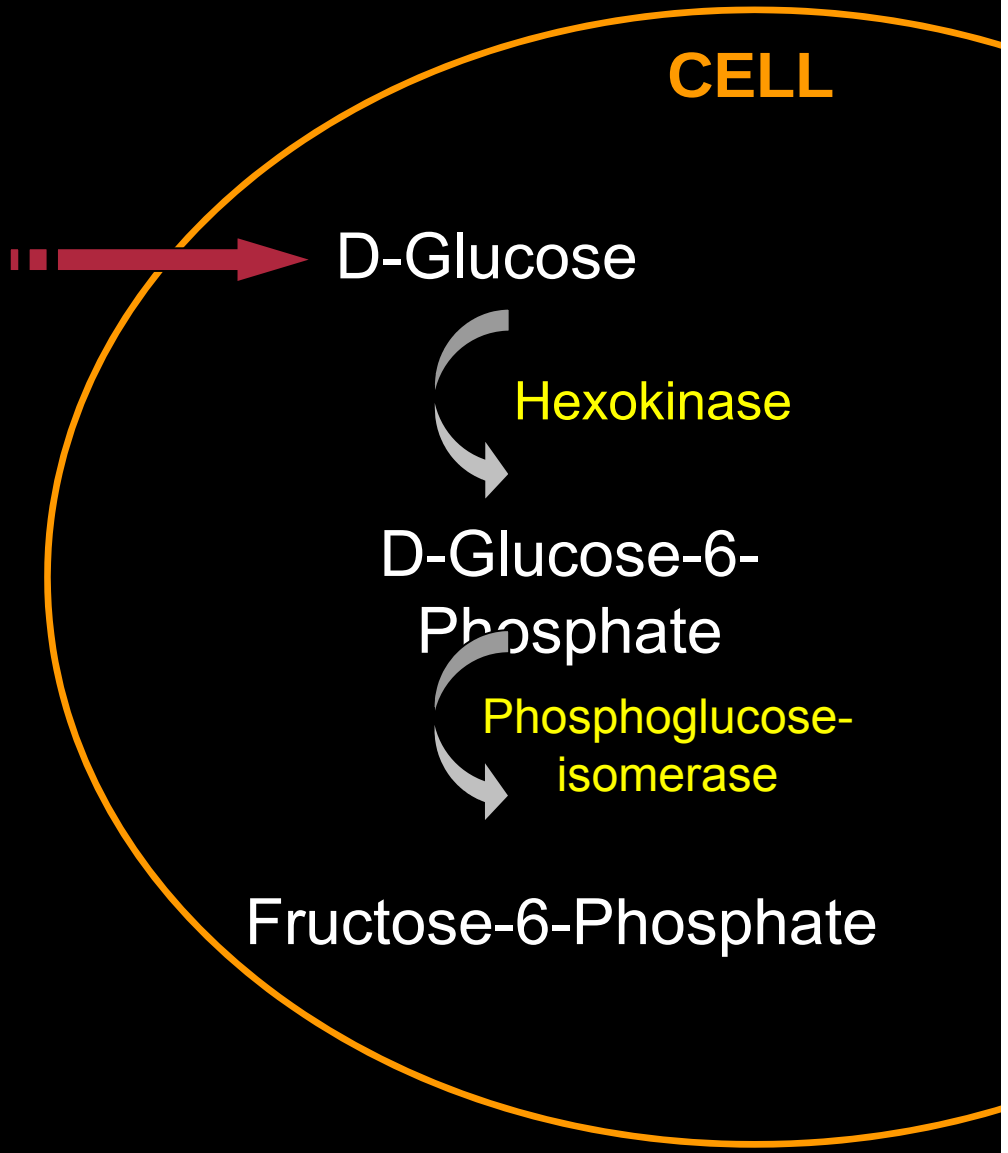
UKM

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

Vitalitätsdiagnostik mit FDG-PET

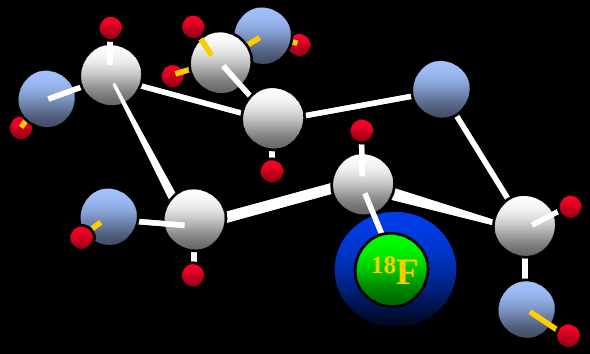
UKM





Vitalitätsdiagnostik mit FDG-PET

UKM



[18F]- Fluor-Deoxy-Glucose

CELL

FDG

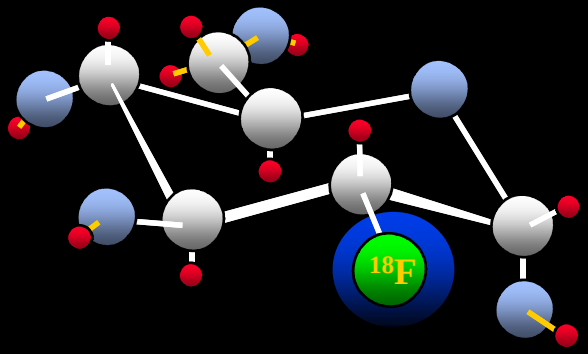
Hexokinase

FDG-6-Phosphate

Phosphoglucose-isomerase

Vitalitätsdiagnostik mit FDG-PET

UKM



[18F]- Fluor Deoxy-Glucose

CELL

FDG

Hexokinase

FDG-6-Phosphate

intracellular TRAPPING

- Glucose transport
- Hexokinase activity

Fallbeispiel #5

UKM

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

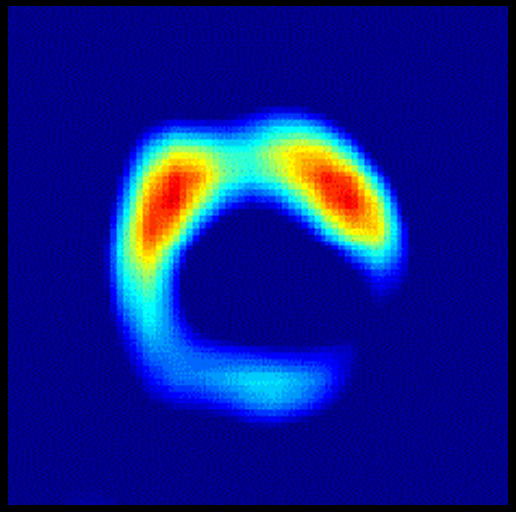
Patient N.W.

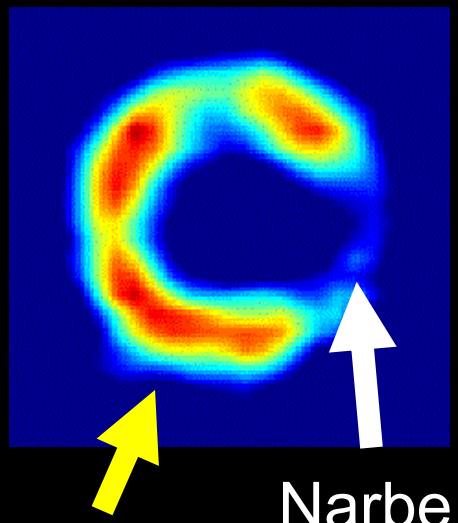
UKM

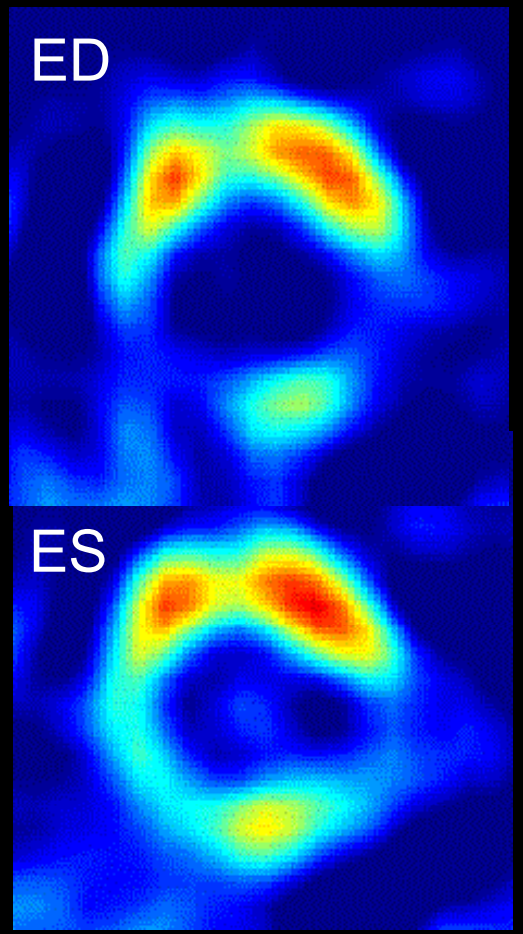
^{99m}Tc-Tetrofosmin
SPECT

^{18}F-FDG
PET

^{99m}Tc-Tetrofosmin
GSPECT

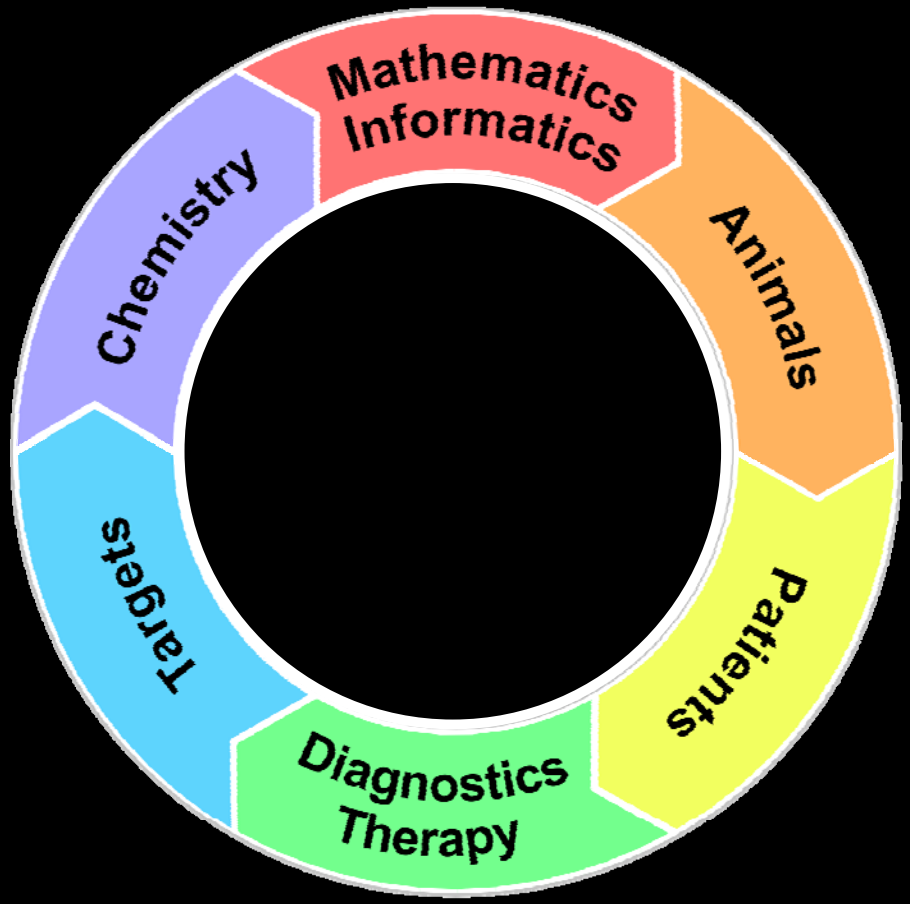






Von der Präklinik in die Klinik …

UKM



Sonderforschungsbereich 656
Molekulare kardiovaskuläre Bildgebung
www.sfbmobil.de

One-Stop-Shop inkl. Prognoseabschätzung

UKM

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

Dias der Vorlesungen

UKM

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

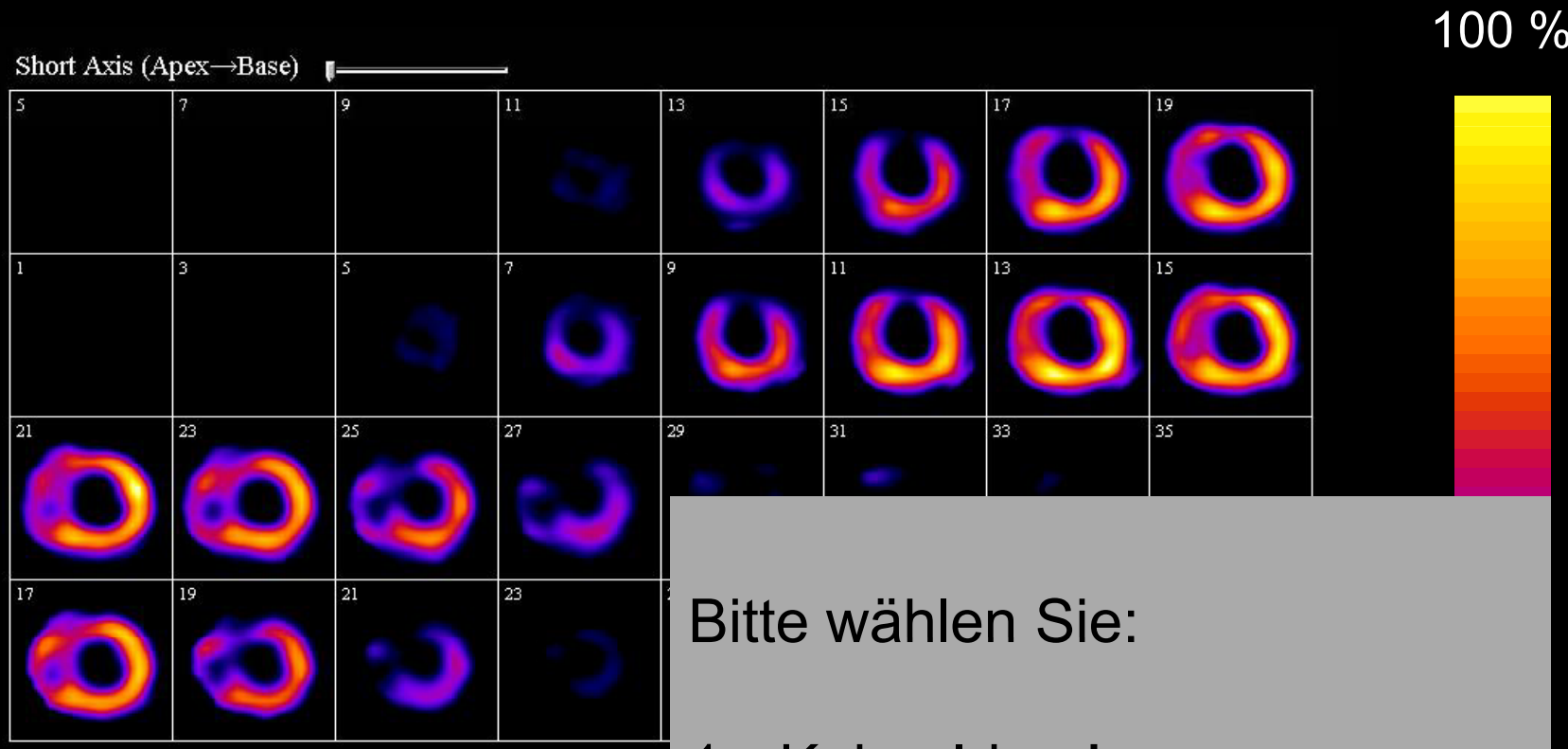
Fallbeispiel #6: Knobelei

UKM

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

Fallbeispiel #6: Was ist das Auffälligste ?

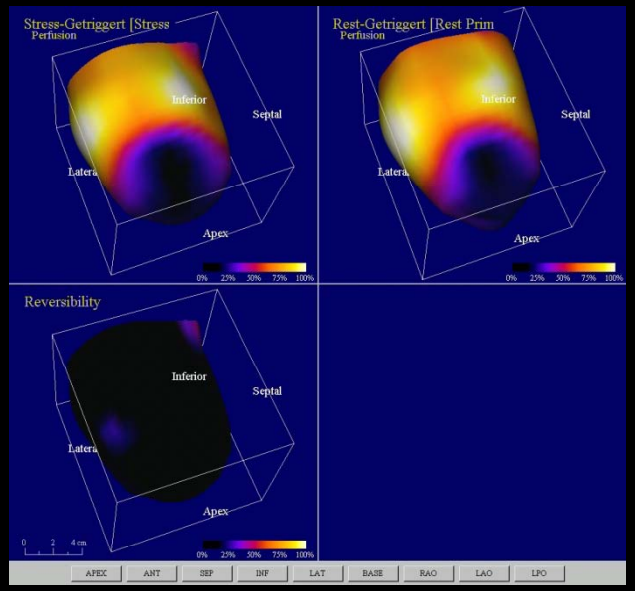
UKM

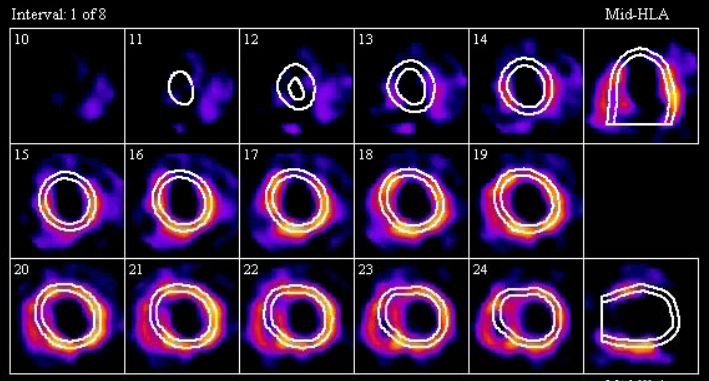


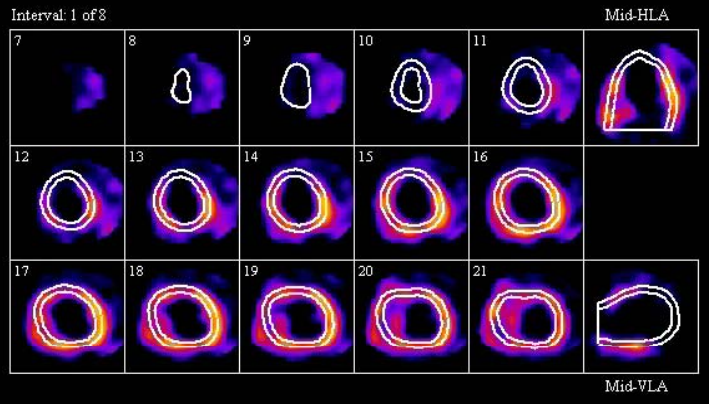
Bitte wählen Sie:

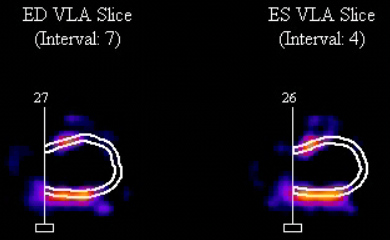
1. Keine Idee !
2. Septaler Infarkt
3. Rechtsherzhypertrophie
4. Globale Ischämie

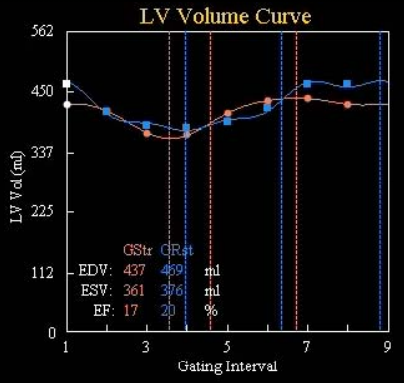
Fallbeispiel #6: Knobelei

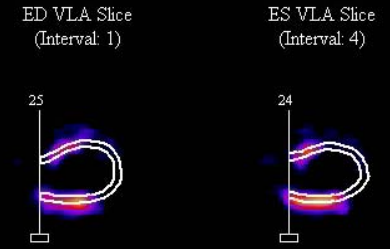








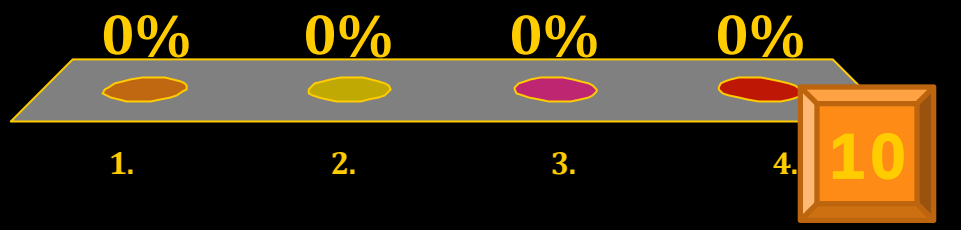




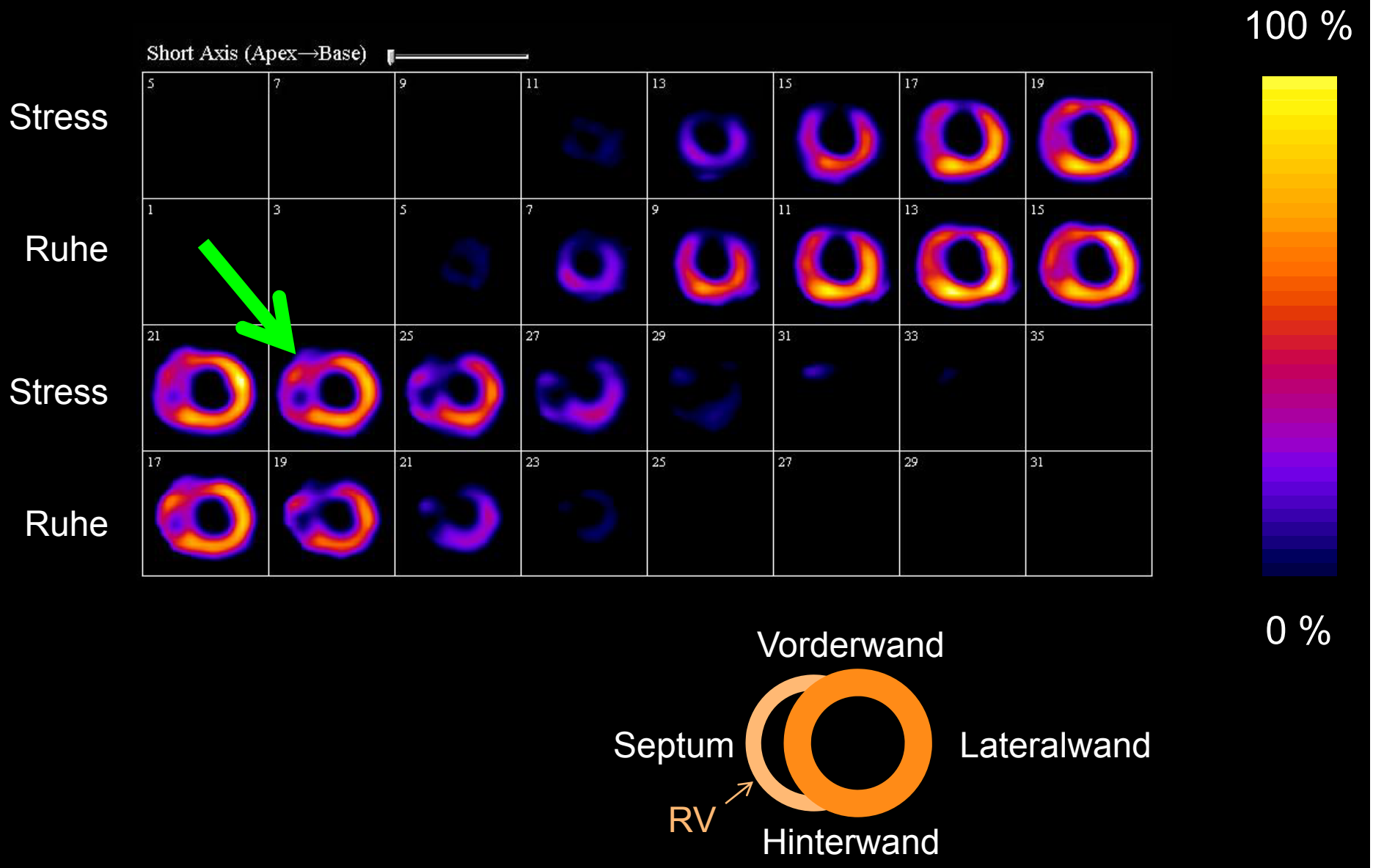
Was ist das Auffälligste ?

UKM

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



Fallbeispiel #6: Rechtherzhypertrophie



Fallbeispiel #6: Konturfindung inkorrekt