FORTBILDUNG FÜR STRAHLENSCHUTZBEAUFTRAGTE

Röntgendiagnostik

Donnerstag, 18. April 2024

FOTO ©Siemens

Thema:
Einsatz alternativer bildgebender Verfahren

Referent:
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Einsatz alternativer bildgebender Verfahren

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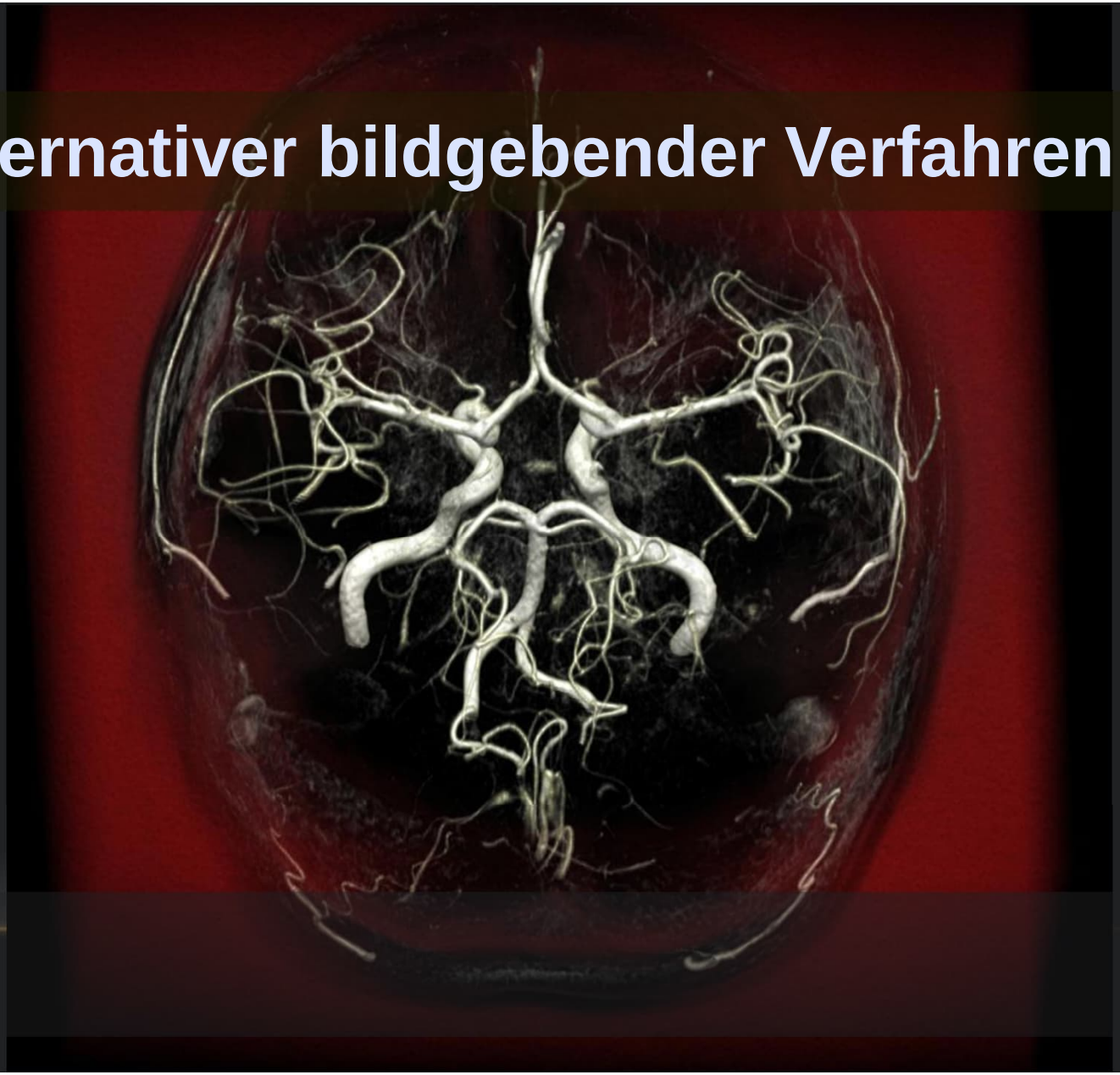
Zentrales Radiologie Institut

Abteilung für Virtuelle Morphologie

JOHANNES KEPLER UNIVERSITÄT LINZ | Kepler Universitäts Klinikum



Ultraschall

Gehirn-Untersuchungen

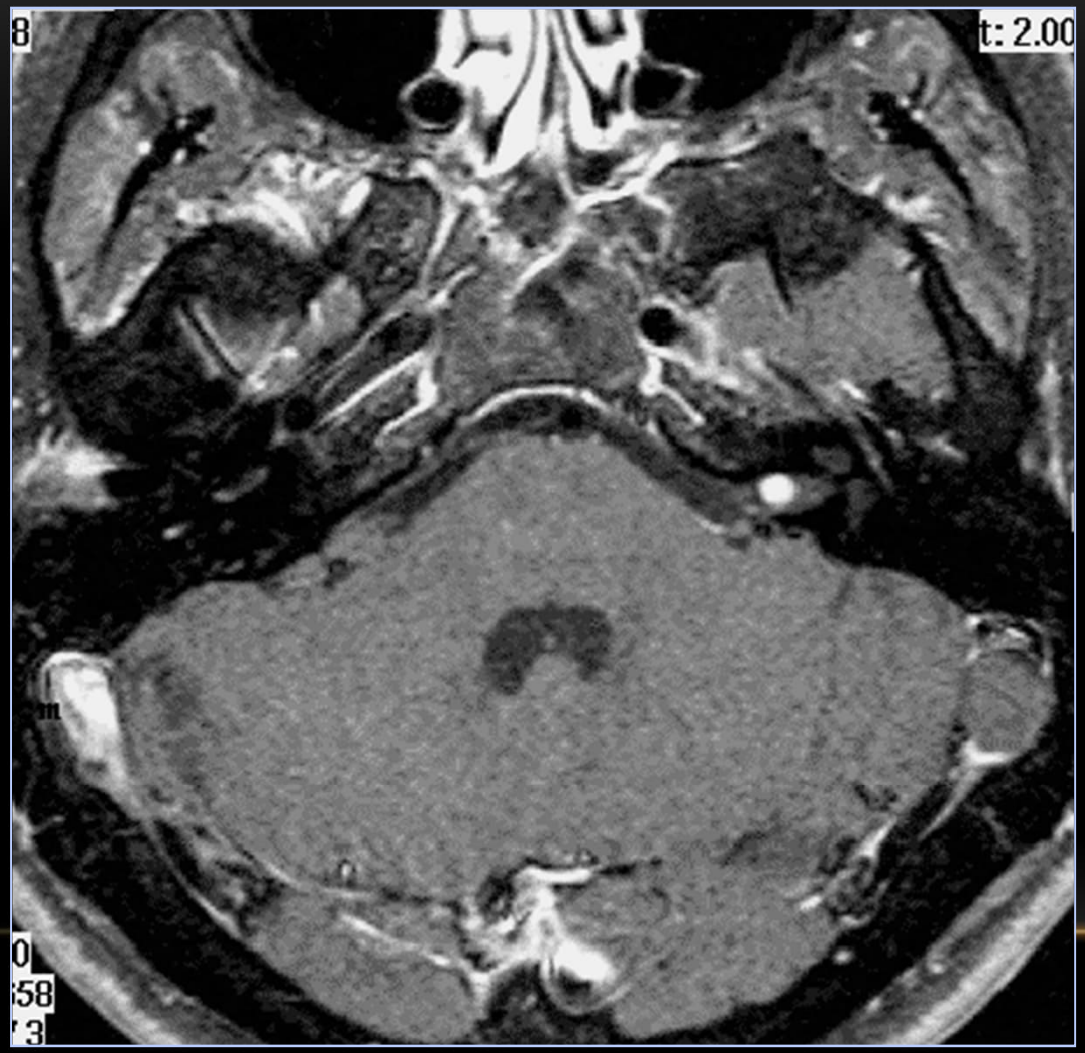
CT oder MR?

Fall

- seit einiger Zeit
- Tinnitus links und leichter Schwindel
- Ergebnis der klinischen Untersuchung:

  Brauche so schnell als möglich Bildgebung!

Kleinhirnbrückenwinkel

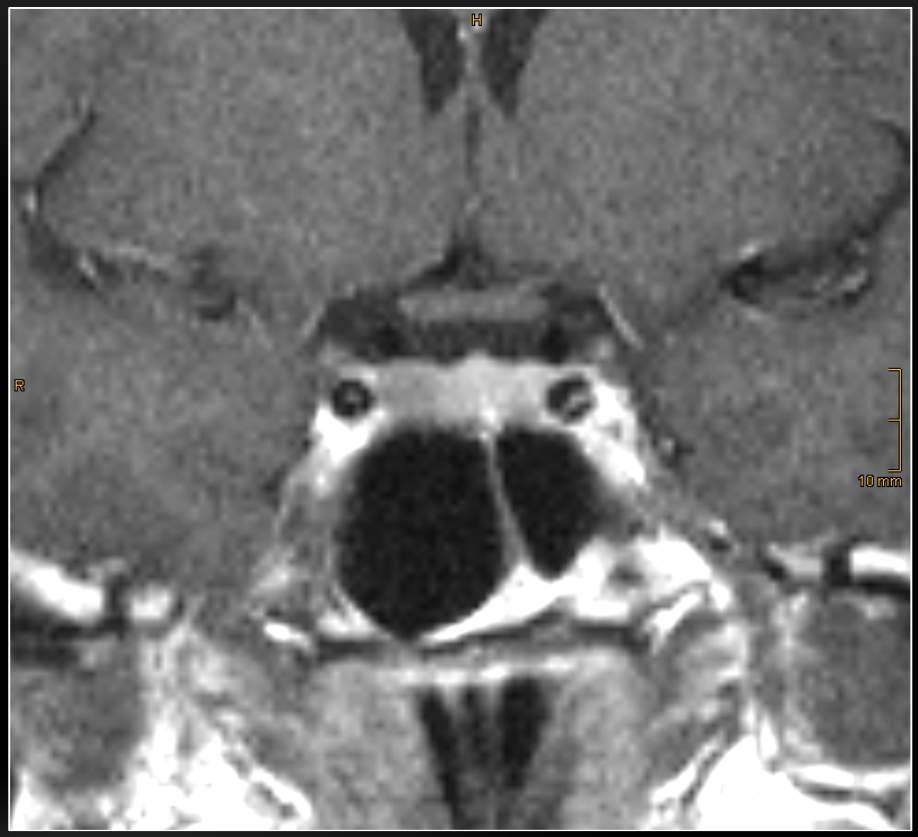


MR T1 KM transversal

Fall

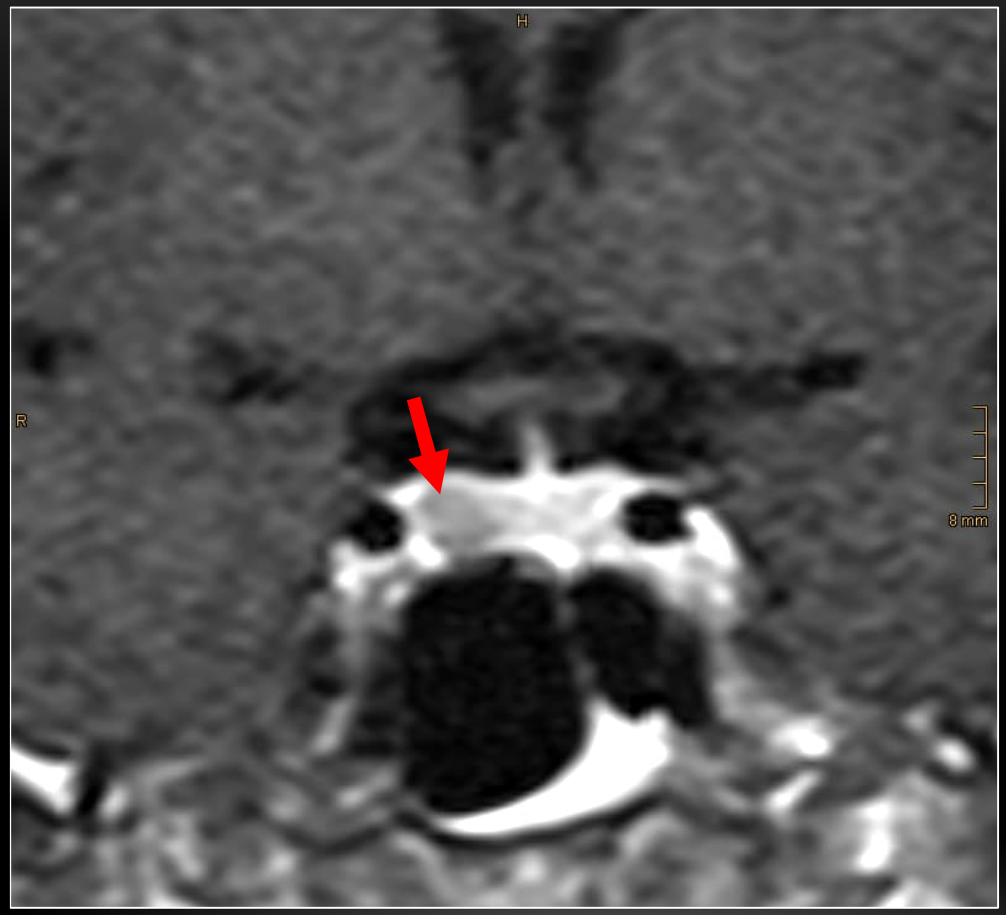
- Zyklusunregelmäßigkeiten
- Prolaktin erhöht
- Bildgebung der Hypophyse erforderlich

Hypophyse



MR T1
KM
koronar

Hypophyse



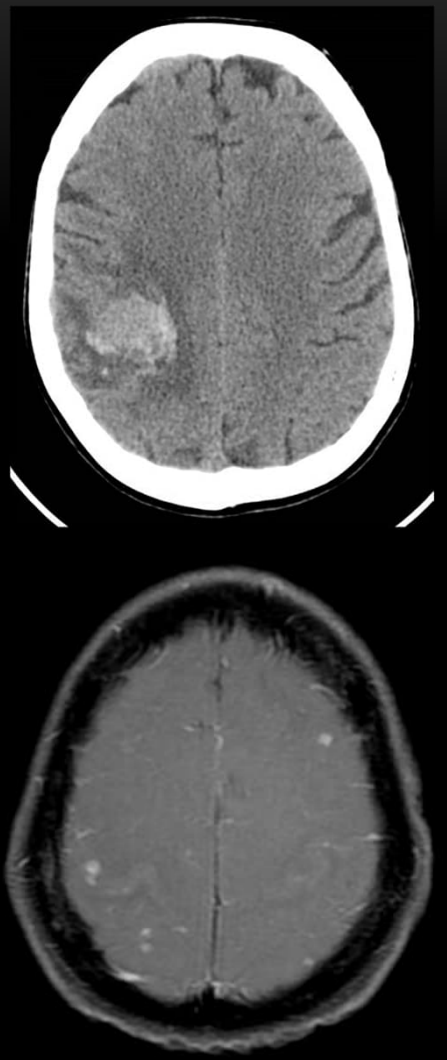
Anflutung

Gehirn-Metastasen

CT oder MR?

Intrakranielle Tumoren

- **MR signifikant besser als CT**
  - **insbesondere auch für Metastasen**
  - **CT noch immer aus Verfügbarkeitsgründen**



MR Verfügbarkeit

Frühe 1990er

6 CT Scanner auf 1 MR scanner **6,0 : 1**

Vor vielen Jahren bereits

Weltweit

1,6 CT Scanner auf 1 MR scanner **1,6 : 1**

Westeuropa

1,3 CT Scanner auf 1 MR scanner **1,3 : 1**

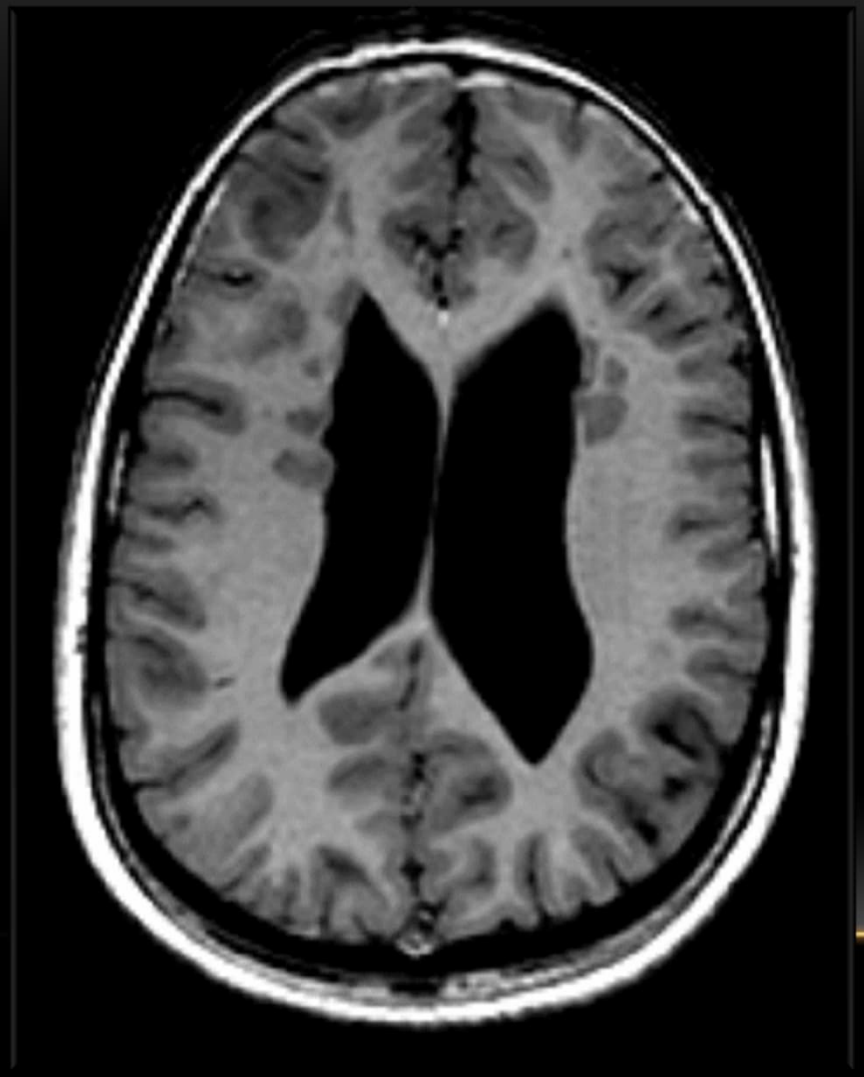
Deutschland, Österreich, Schweiz

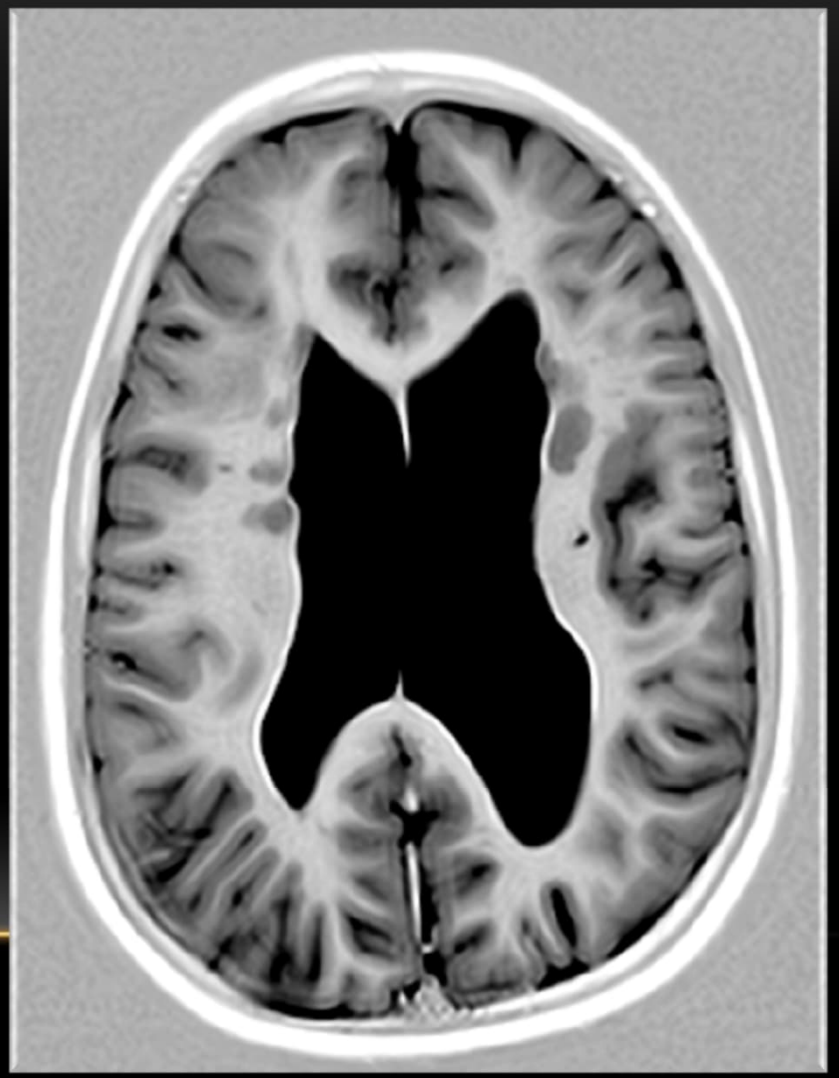
1,1 CT Scanner auf 1 MR scanner **1,1 : 1**

Epilepsie

CT oder MR?

Epilepsie: Heterotopie – MR!





Subarachnoidalblutung

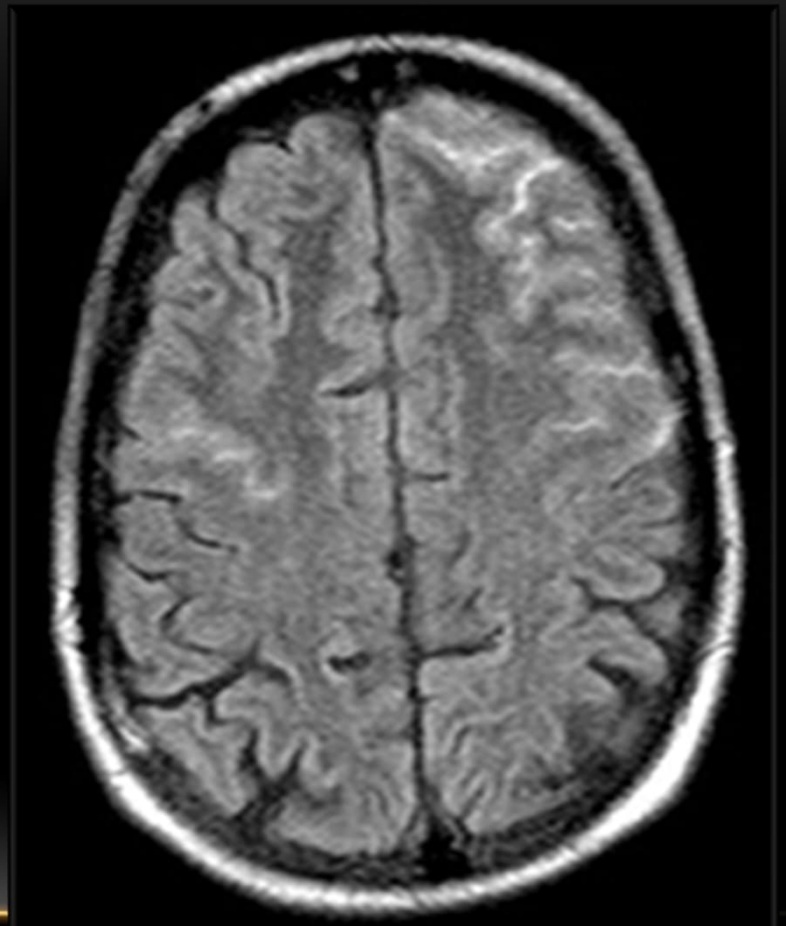
CT oder MR?

subakute Subarachnoidalblutung

- Zeitraum: 5 Tage bis 3 Monate
- MR klar CT überlegen
- Sensitivität
- CT 45 %
- MR (PD/FLAIR) 100 %

subakute Subarachnoidalblutung

CT 27.10.2003



MR 30.10.2003

Wirbelsäule
Bandscheibenvorfall

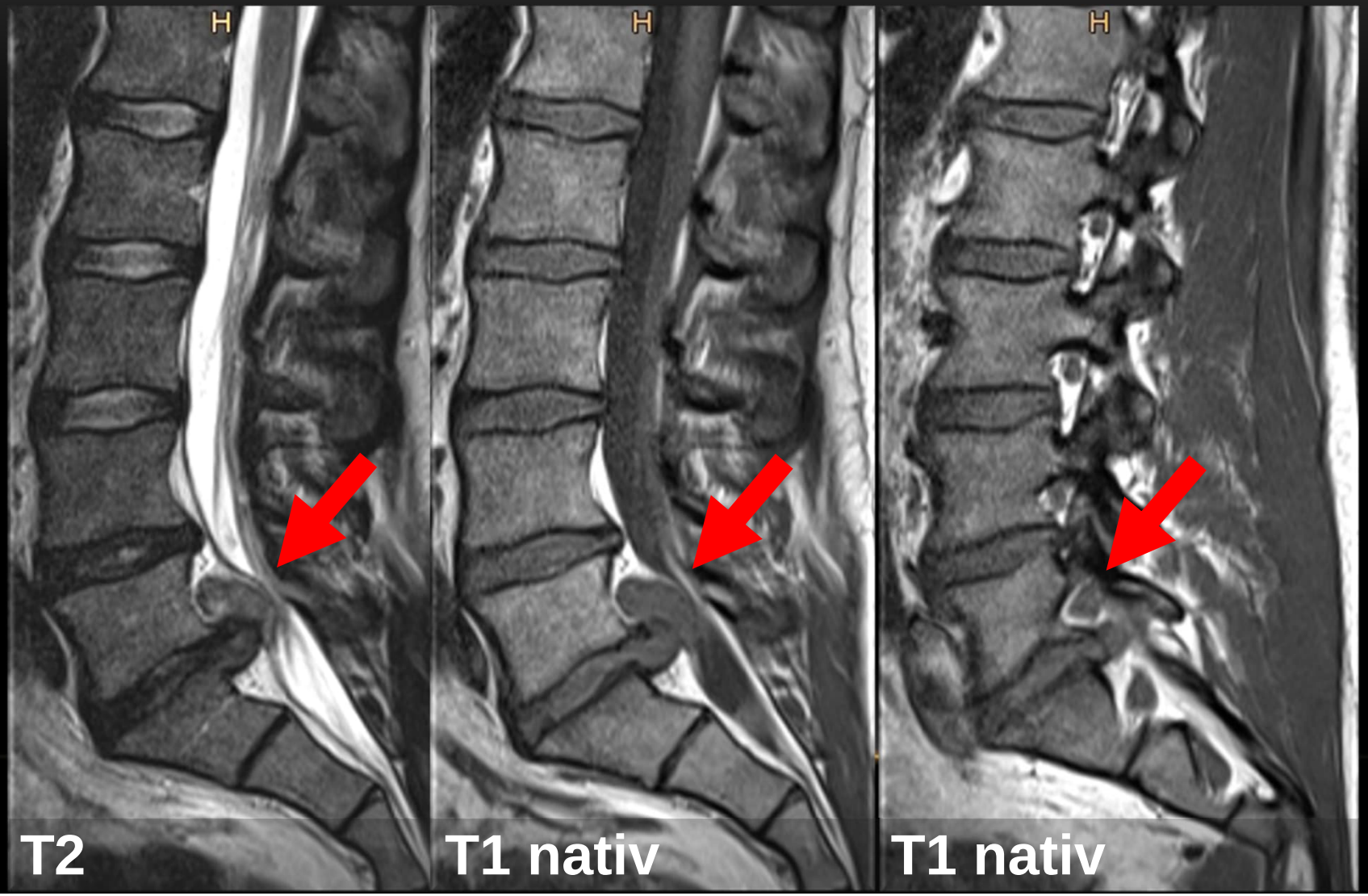
CT oder MR?

HWS: sowieso MR

Diskusprolaps lumbal: CT

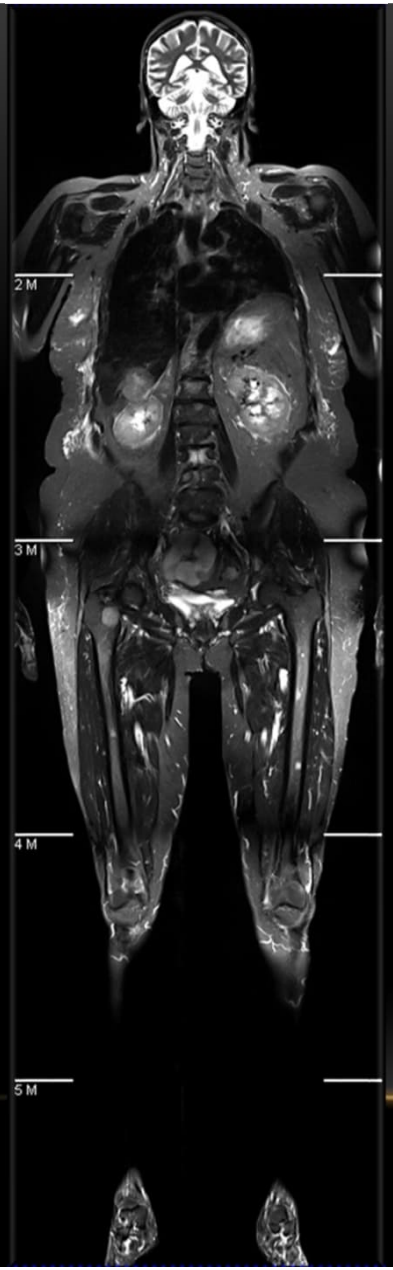
CT

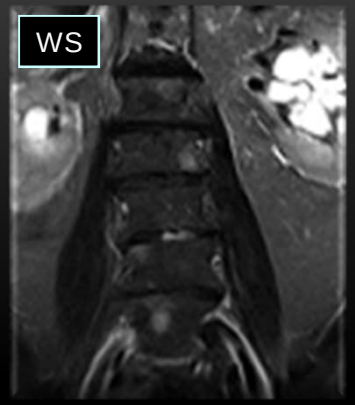
Diskusprolaps lumbal: Sequester

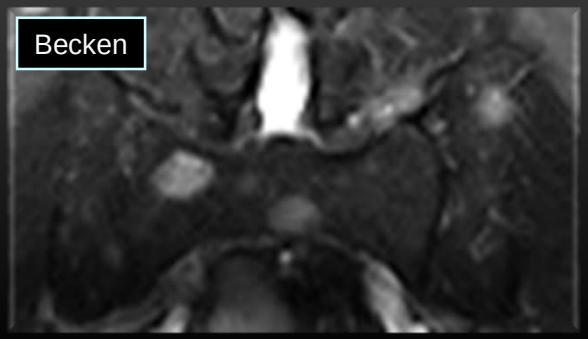


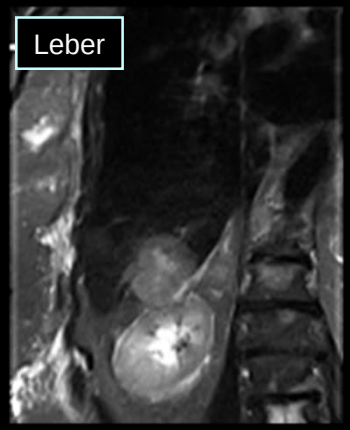
Ganzkörper-MR?
Onkologie

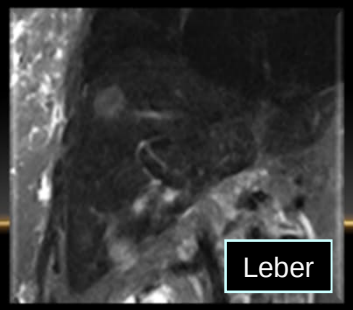
STIR











Mamma-Karzinom

Ganzkörper-MR

Ghanem et al. In vivo 2006; 20: 173-182

129 Patienten, whole body MR STIR Sequenzen, Vgl. mit Skelettszintigraphie

MR und Szinti übereinstimmend	**81 %**
MR und Szinti nicht übereinstimmend	**19 %**
MR zeigte mehr Tumorbefall	45 %
Skelettszintigraphie besser als MR	12 %
Skelettszintigraphie negativ, MR positiv	12 %
Skelettszintigraphie positiv, MR negativ	7 %
Zusätzliche Tumorbefunde in MR	60 %

Topic 1

Conclusion:

Whole body MR sollte Skelettszintigraphie ersetzen

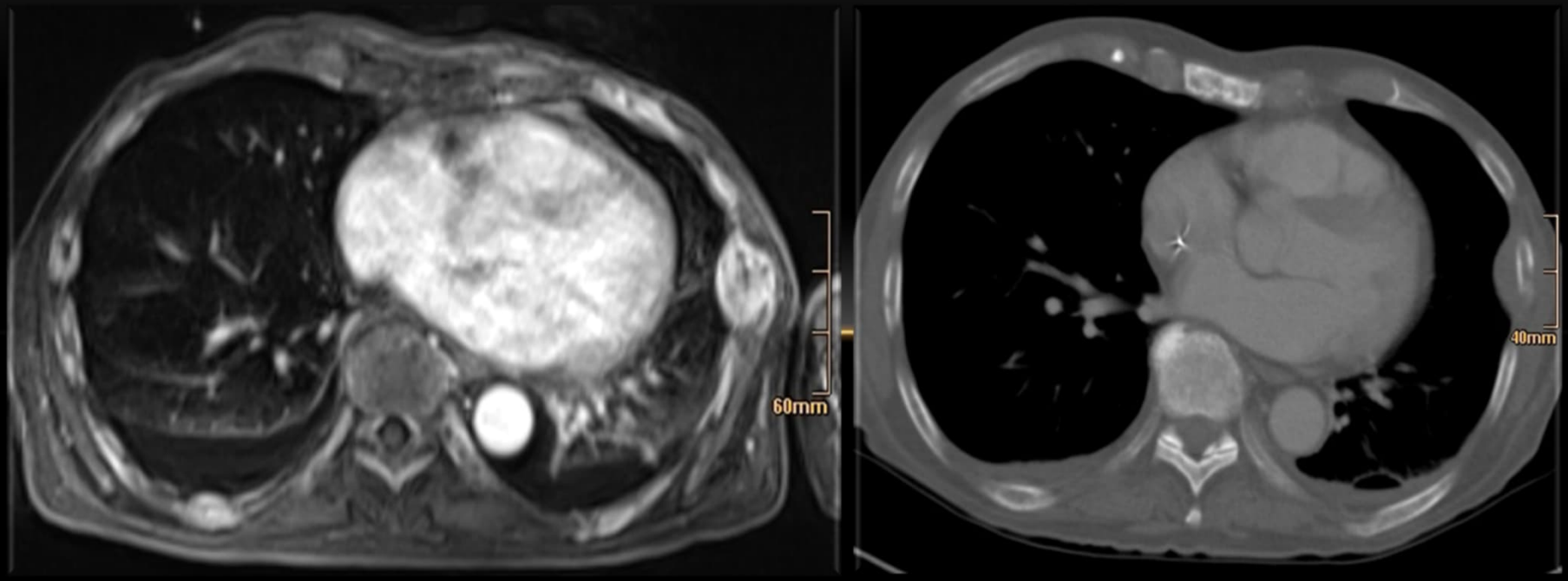
Onco MR – whole body

- Mit Kontrastmittel
- Noch aufwendiger
- Junge Patienten?
- Nur ausgewählte Tumoren (z.B. Keimzell-Tumoren, Lymphome, …?)

Topic 2

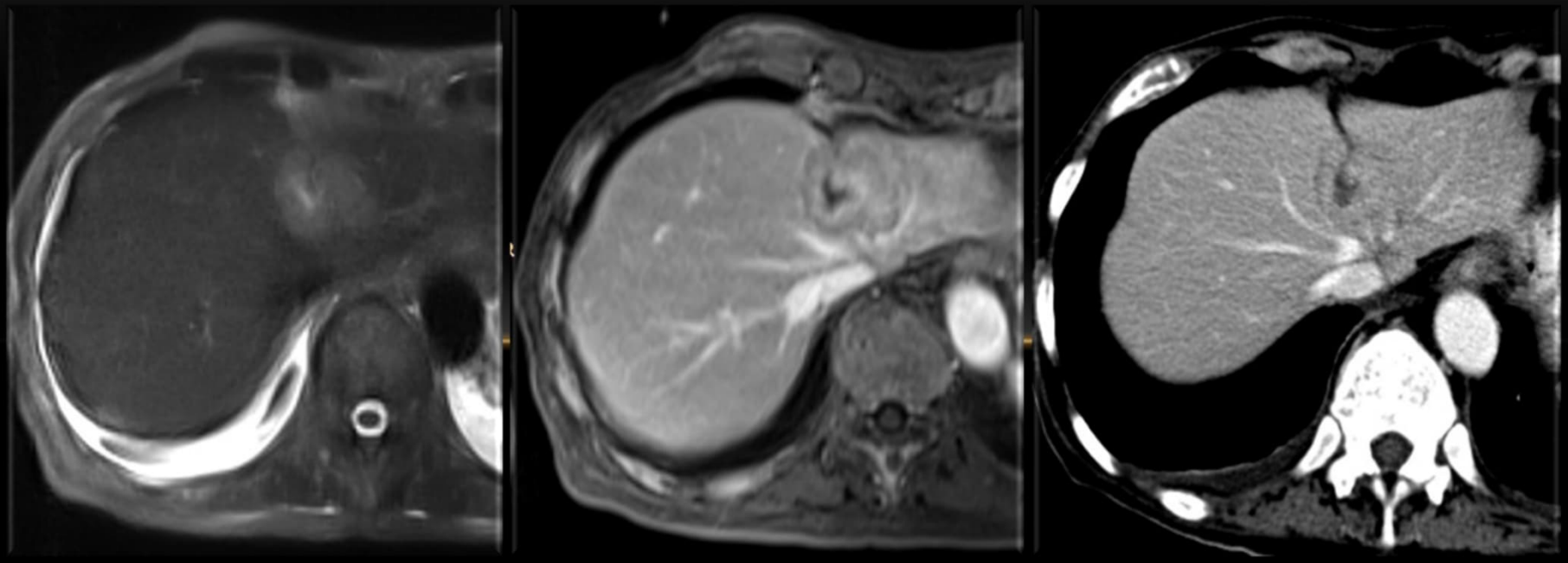
MR onco follow up

1.5 T



MR onco follow up

1.5 T



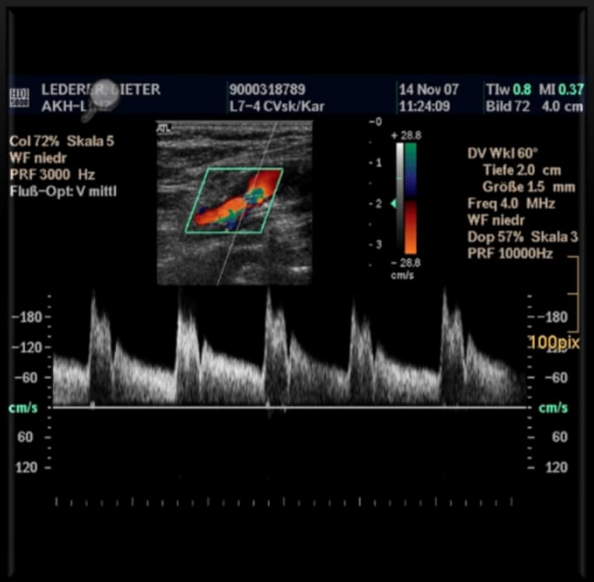
T2 HASTE MR

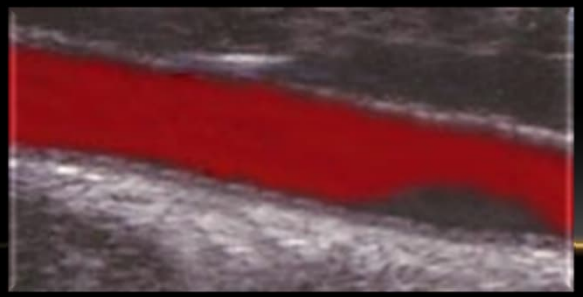
VIBE
MR

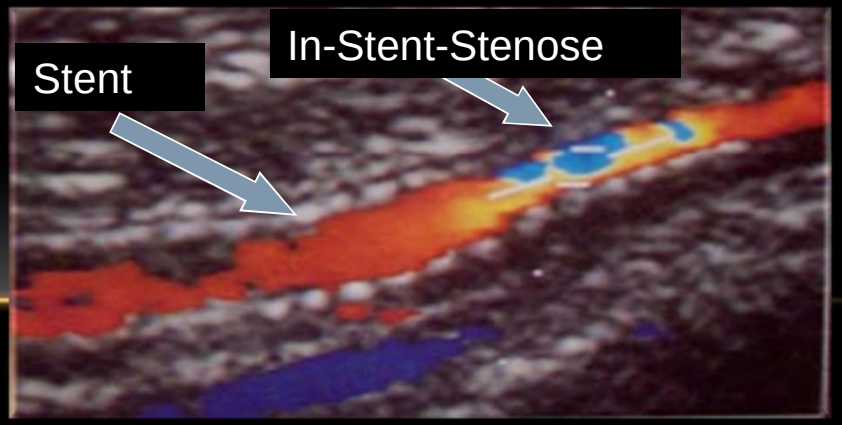
64 MSCT

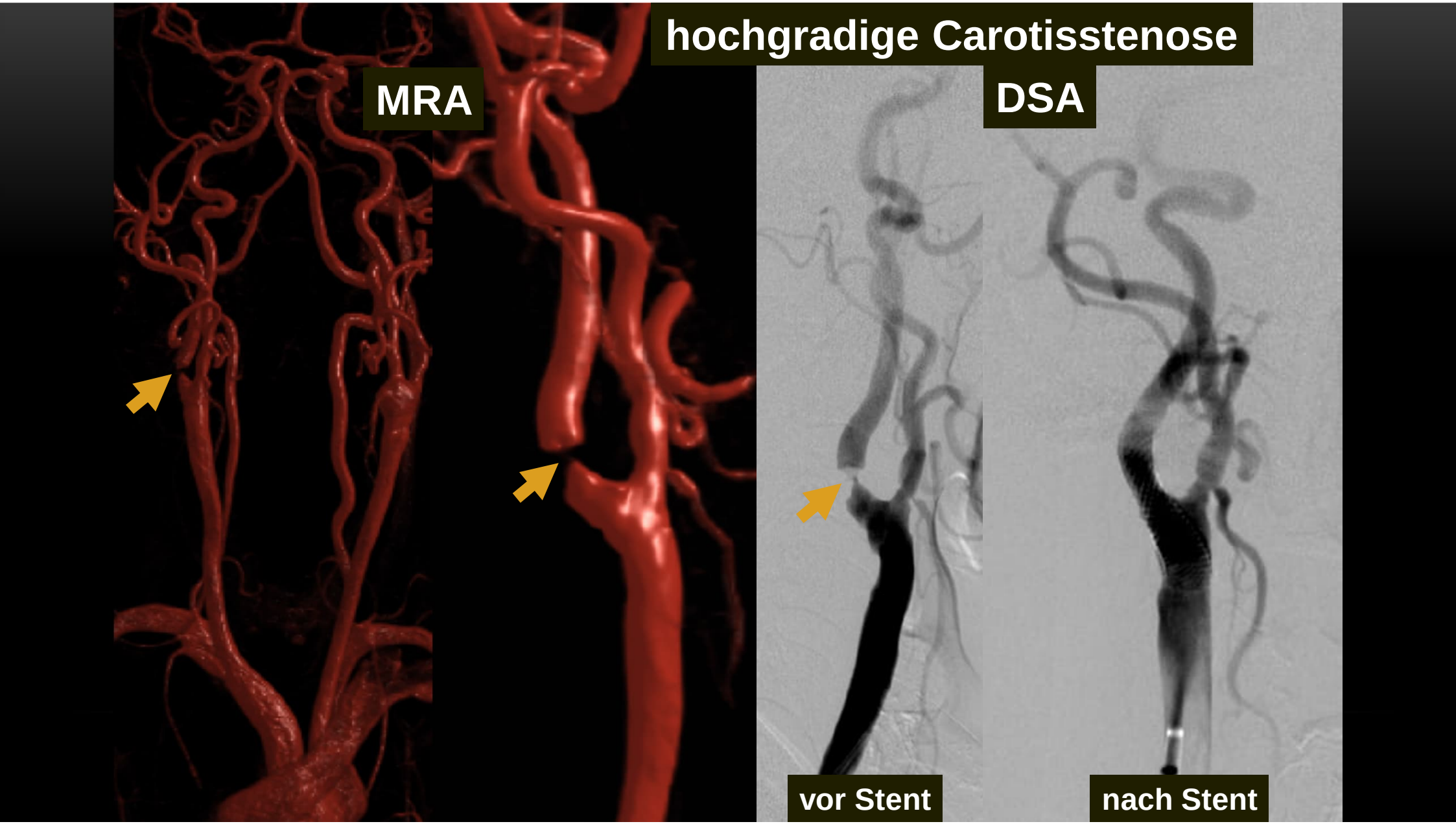
Gefäßdiagnostik

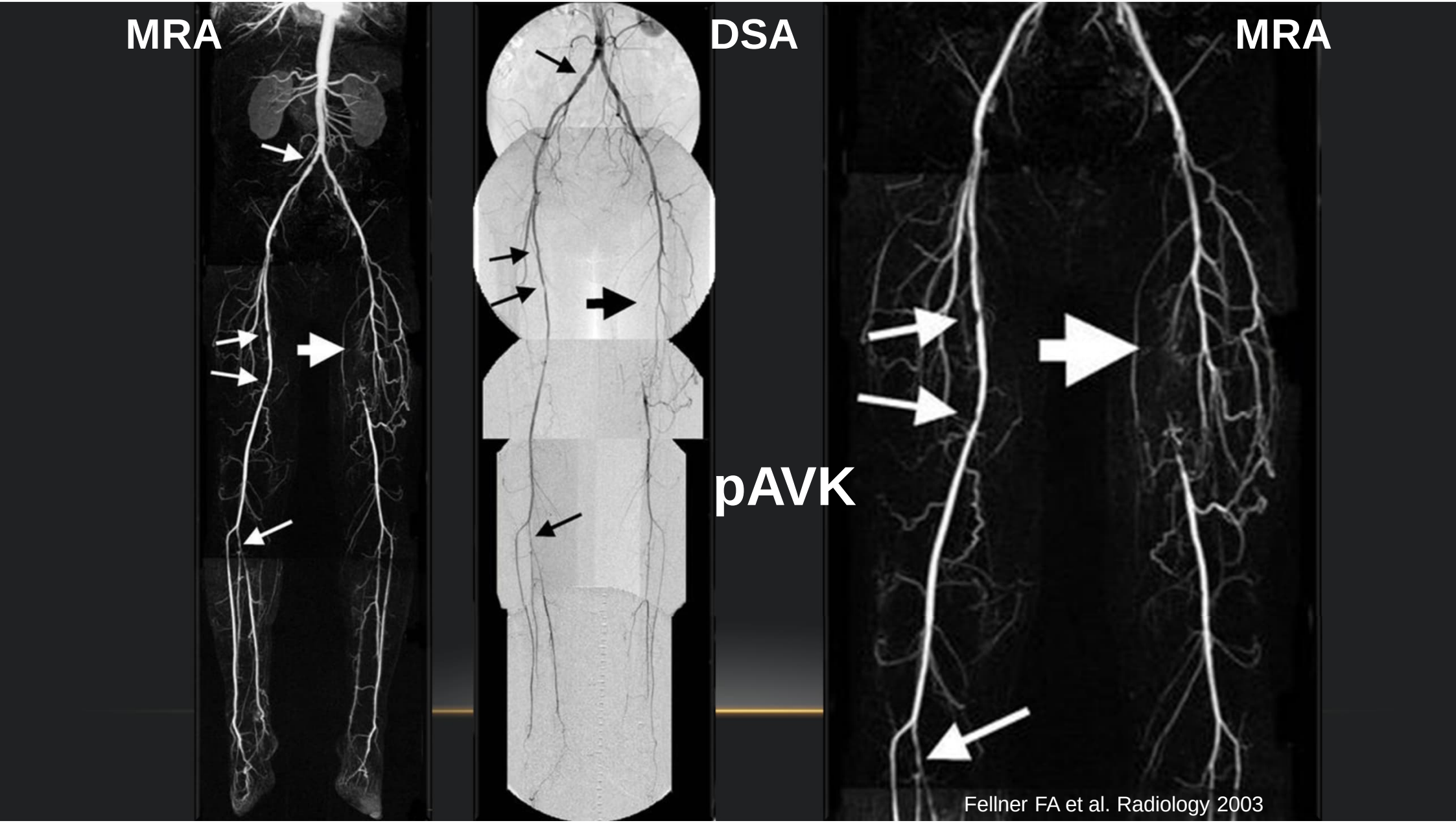
Gefäßdiagnostik – Ultraschall

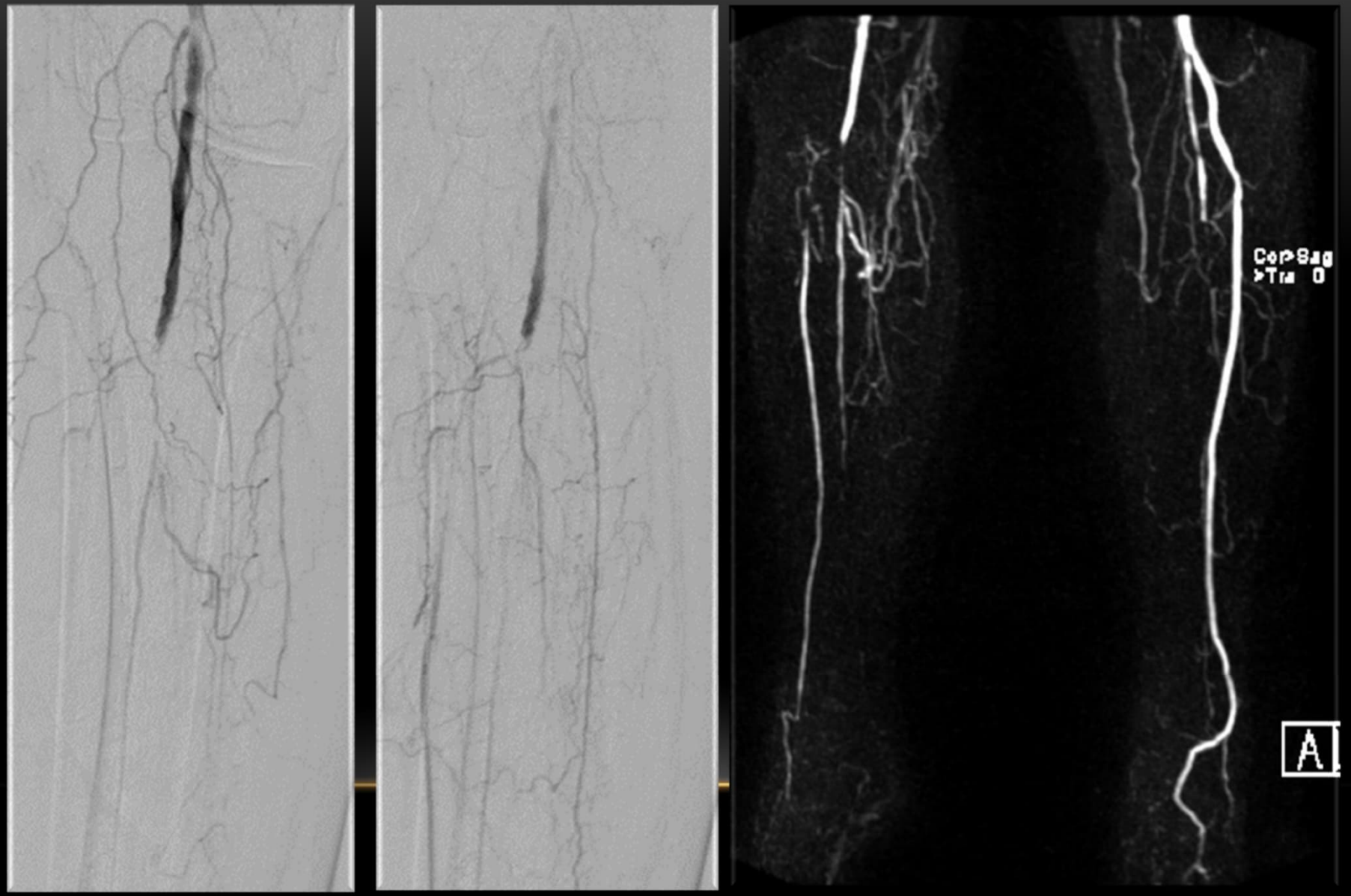







hochgradige Carotisstenose
MRA
DSA
vor Stent
nach Stent


MRA
DSA
MRA
pAVK
Fellner FA et al. Radiology 2003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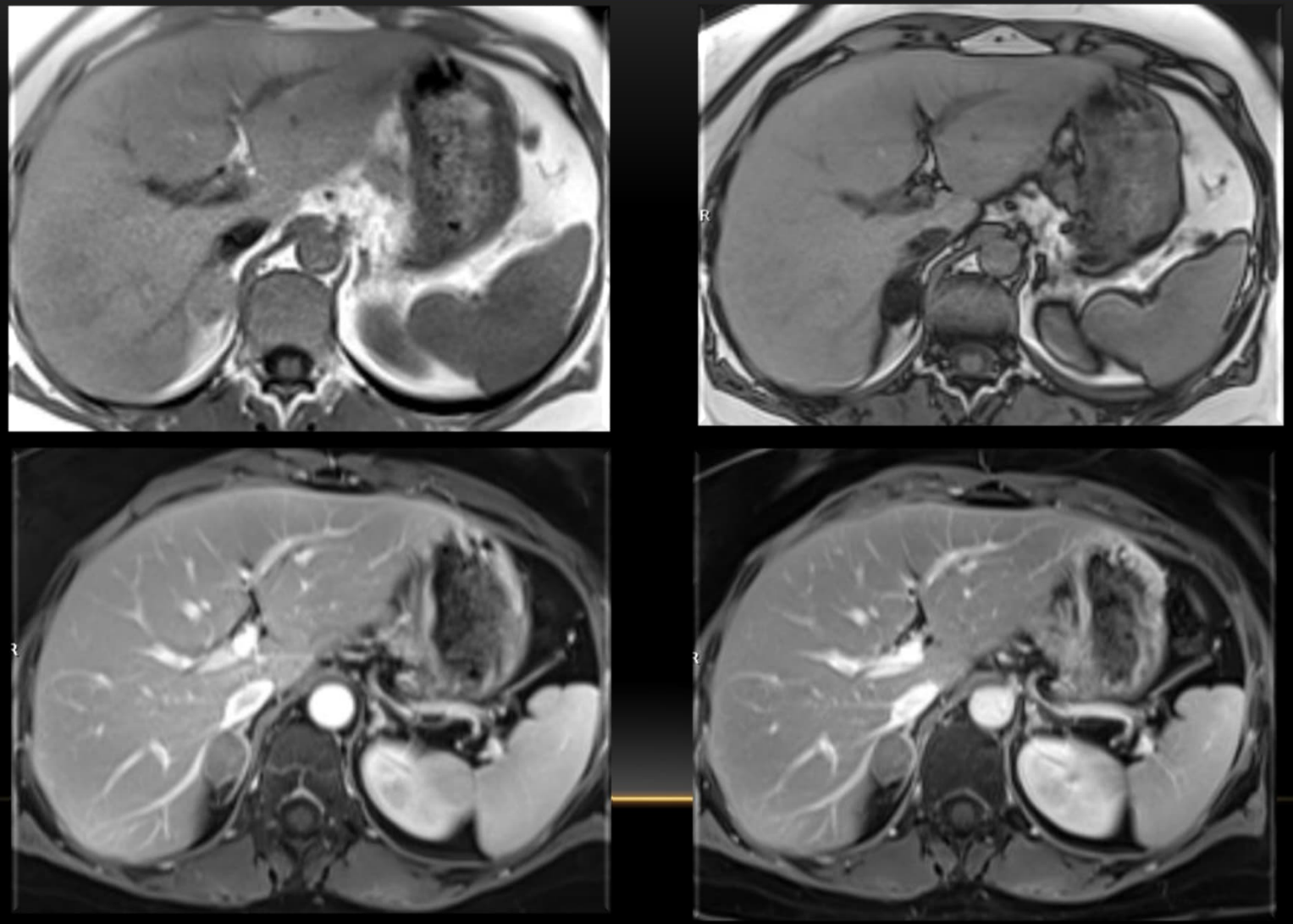
Alternativen zur Computer-Tomographie?

Leber-MR: Diffusion

Lebermetastasen

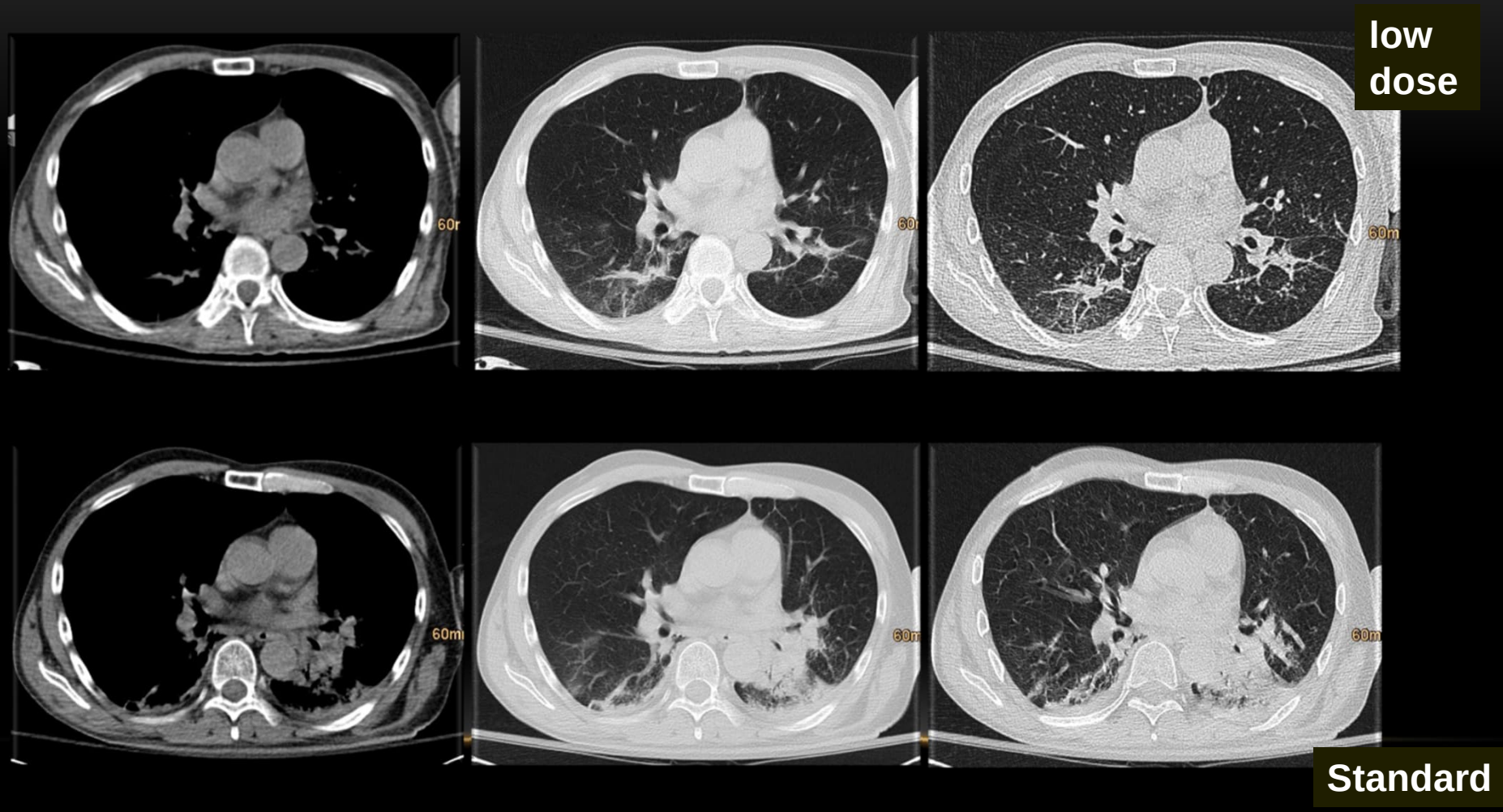
Nebennieren-Adenom



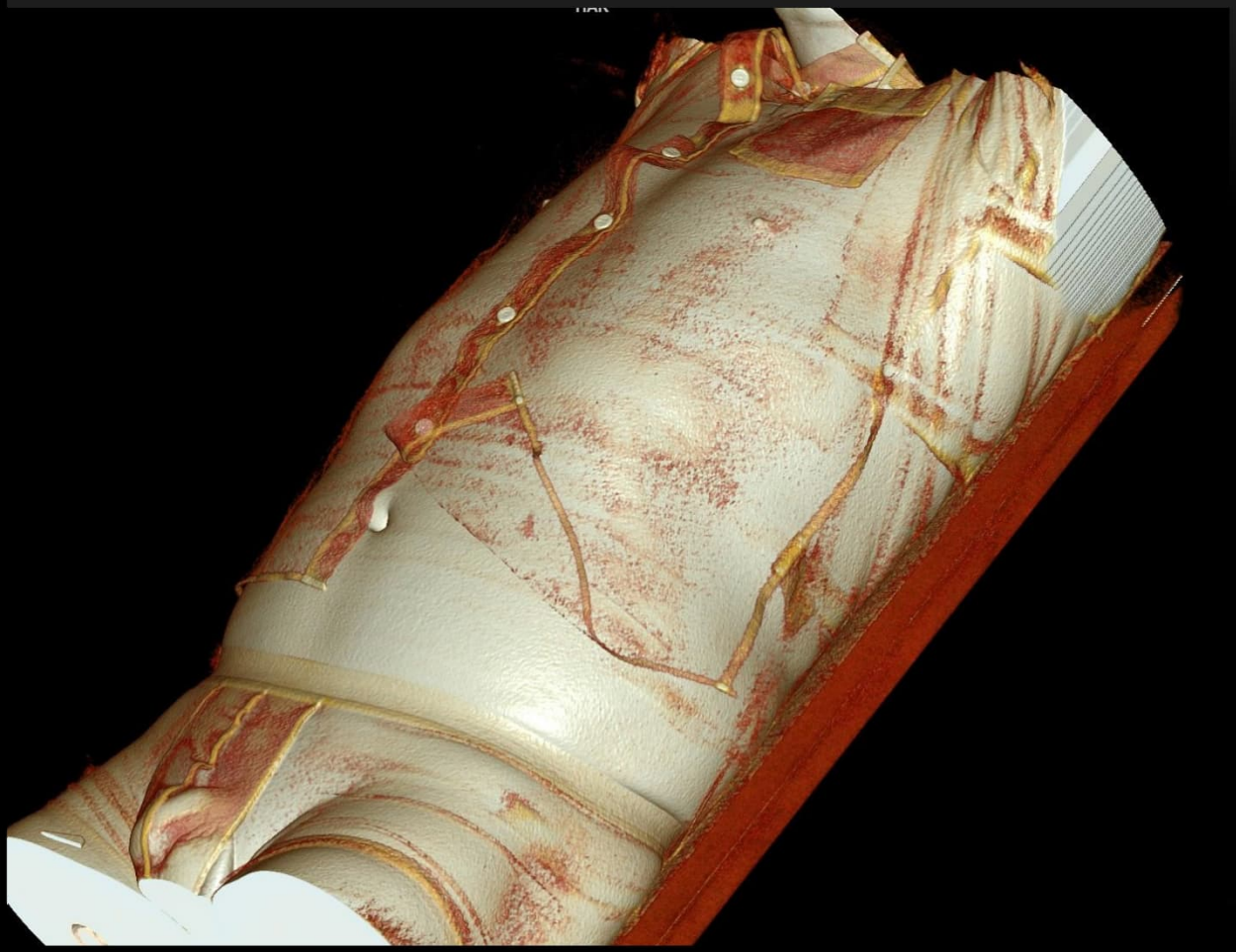
3 Tesla: 3D TOF

Renale CE MRA 6 ml Gadovist

Strahlenschutz durch weniger Strahlung



moderne Geräte



Dosisreduktion

Aorta

CT-Typ	DLP total (mGycm)	d DLP total (mGycm)	DLP je nach Protokoll (mGycm)						mSv total
Force/Dual source	724	202	nativ Flash:	241,1	arteriell Flash (1.Phase):	473	Dosisreduktion 22%		10,9
Cardiac 64	926		nativ:	408,49	arteriell (1.Phase):	501,59			13,9
Force/Dual source	570	95,57	nativ Flash:	210,4	arteriell Flash (1.Phase):	350,5	Dosisreduktion 15%		8,6
Cardiac 64	665,57		nativ:	261,53	arteriell (1.Phase):	392,61			10,0
Force/Dual source	575	412,06	nativ Flash:	238,8	arteriell Flash (1.Phase):	330,2	Dosisreduktion 42%		8,6
Cardiac 64	987,06		nativ:	438,34	arteriell (1.Phase):	541,86			14,8
Force/Dual source	426	354	nativ Flash:	189,5	arteriell Flash (1.Phase):	227,2	Dosisreduktion 46%		6,4
Cardiac 64	780		nativ:	311	arteriell (1.Phase):	451			11.7
Force/Dual source	83	62,79			arteriell 1 Phase		Dosisreduktion 44%		1,2
Cardiac 64	145,79								2,2

Dosisreduktion

Thorax

CT-Typ	DLP total (mGycm)	d DLP total (mGycm)	mSv total	
Force/Dual source	25	39	0,4	Reduktion 61%
Sensation Open	64		0,9	
Force/Dual source	19	47,93	0,3	Reduktion 72%
Sensation Open	66,93		0,9	
Force/Dual source	18	43,91	0,3	Reduktion 71%
Sensation Open	61,91		0,9	
Force/Dual source	18	28,97	0,3	Reduktion 62%
Sensation Open	46,97		0,7	
Force/Dual source	131	79,59	1,8	Reduktion 38%
Cardiac 64	210,59		2,9	
Force/Dual source	143	237,12	2,0	Reduktion 63%
Cardiac 64	380,12		5,3	
Force/Dual source	22	49,99	0,3	Reduktion 70%
Sensation Open	71,99		1,0	
Force/Dual source	143	185,51	2,0	Reduktion 67%
Sensation Open	328,51		4,6	
Force/Dual source	24	44,31	0,3	Reduktion 70%
Cardiac 64	68,31		1,0	
Force/Dual source	60	73,11	0,8	Reduktion 65%
Cardiac 64	133,11		1,9	

Strahlen – Dosis

Effect of low doses of ionising rad function in adulthood: Swedish pc

Per Hall, Hans-Olov Adami, Dimitrios Trichopoulos, Nanc Martin Ingvar, Marie Lundell, Fredrik Granath

Abstract

Objective To determine whether exposure to low doses of ionising radiation in infancy affects cognitive function in adulthood.
Design Population based cohort study.
Setting Sweden.
Participants 3094 men who had received radiation for cutaneous haemangioma before age 18 months during 1930-59.
Main outcome measures Radiation dose to frontal and posterior parts of the brain, and association between dose and intellectual capacity at age 18 or 19 years based on cognitive tests (learning ability, logical reasoning, spatial recognition) and high school attendance.
Results The proportion of boys who attended high school decreased with increasing doses of radiation to both the frontal and the posterior parts of the brain from about 32% among those not exposed to around 17% in those who received > 250 mGy. For the frontal dose, the multivariate odds ratio was 0.47 (95% confidence interval 0.26 to 0.85, P for trend 0.0003) and for the posterior dose it was 0.59 (0.23 to 1.47, 0.0005). A negative dose-response relation was also evident for the three cognitive tests for learning ability and logical reasoning but not for the test of spatial recognition.
Conclusions Low doses of ionising radiation to the brain in infancy influence cognitive abilities in adulthood.

The NEW ENGLAI JOURNAL of MEDI

ESTABLISHED IN 1812 AUGUST 27, 2009

Exposure to Low-Dose Ionizing Ra from Medical Imaging Procedu

Reza Fazel, M.D., M.Sc., Harlan M. Krumholz, M.D., S.M., Yongfei Wang, M Jersey Chen, M.D., M.P.H., Henry H. Ting, M.D., M.B.A., Nilay D. Shah, Ph.D., Andrew J. Einstein, M.D., Ph.D., and Brahmajee K. Nallamothu,

ABSTRACT

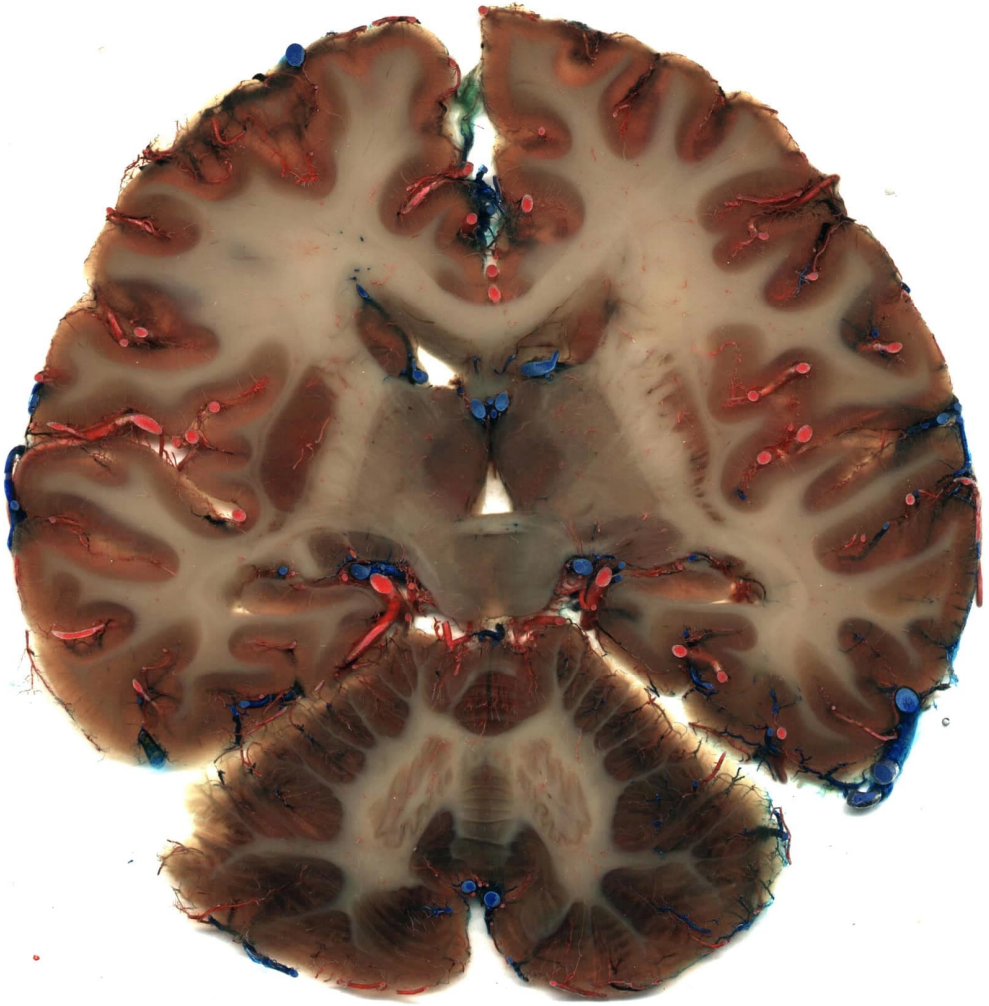
BACKGROUND
The growing use of imaging procedures in the United States has raised concerns about exposure to low-dose ionizing radiation in the general population.

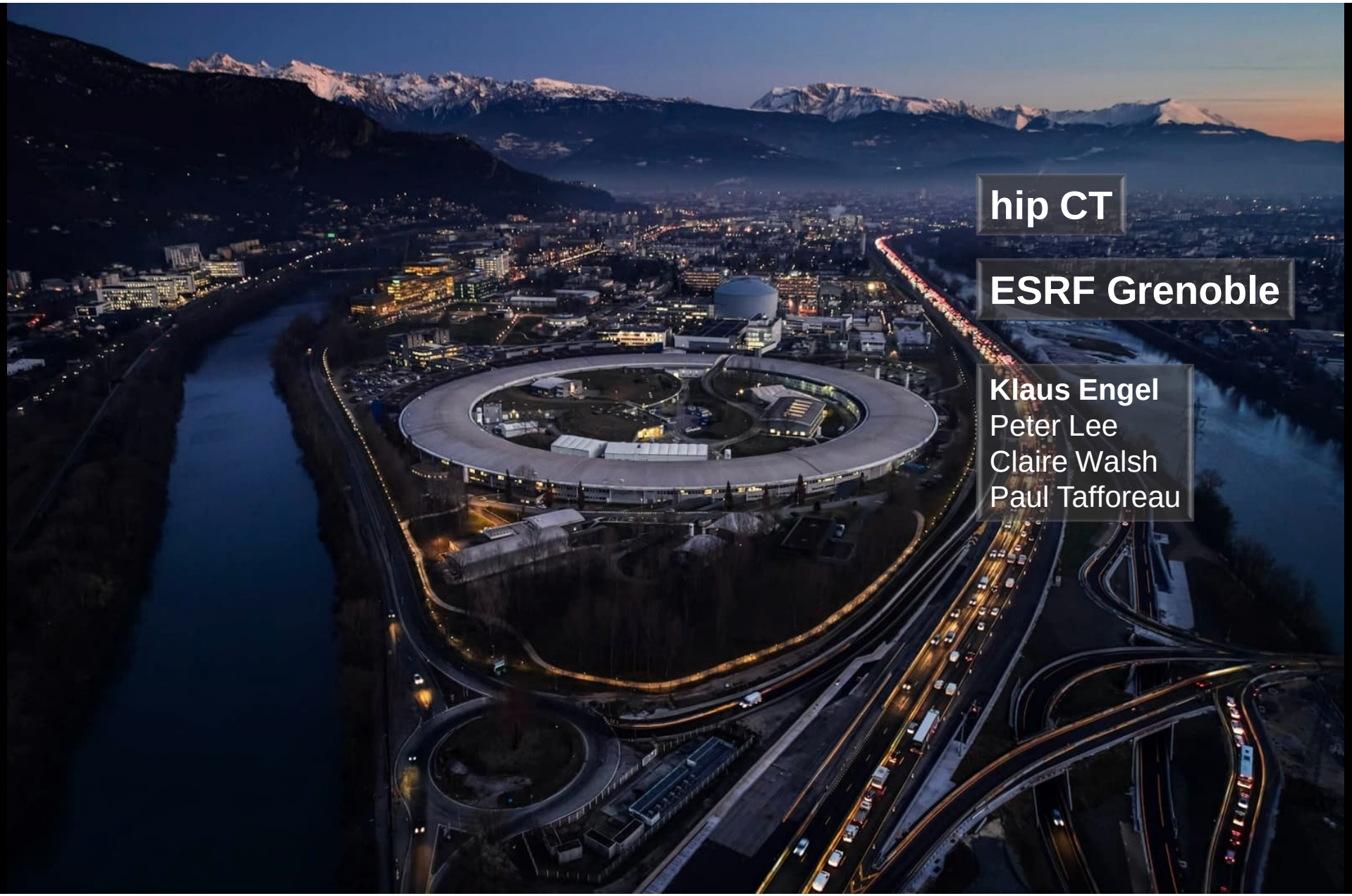
METHODS
We identified 952,420 nonelderly adults (between 18 and 64 years of age) in five health care markets across the United States between January 1, 2005, and December 31, 2007. Utilization data were used to estimate cumulative effective doses of radiation from imaging procedures and to calculate population-based rates of exposure, with annual effective doses defined as low (≤3 mSv), moderate (>3 to 20 mSv), high (>20 to 50 mSv), or very high (>50 mSv).

RESULTS
During the study period, 655,613 enrollees (68.8%) underwent at least one imaging procedure associated with radiation exposure. The mean (±SD) cumulative effective dose from imaging procedures was 2.4±6.0 mSv per enrollee per year; however, a wide distribution was noted, with a median effective dose of 0.1 mSv per enrollee per year (interquartile range, 0.0 to 1.7). Overall, moderate effective doses of radiation were incurred in 193.8 enrollees per 1000 per year, whereas high and very high doses were incurred in 18.6 and 1.9 enrollees per 1000 per year, respectively. In general, cumulative effective doses of radiation from imaging procedures increased with advancing age and were higher in women than in men. Computed tomographic and nuclear imaging accounted for 75.4% of the cumulative effective dose, with 81.8% of the total administered in outpatient settings.

CONCLUSIONS
Imaging procedures are an important source of exposure to ionizing radiation in the United States and can result in high cumulative effective doses of radiation.

courtesy: Prof. Hammer, Anatomie Graz

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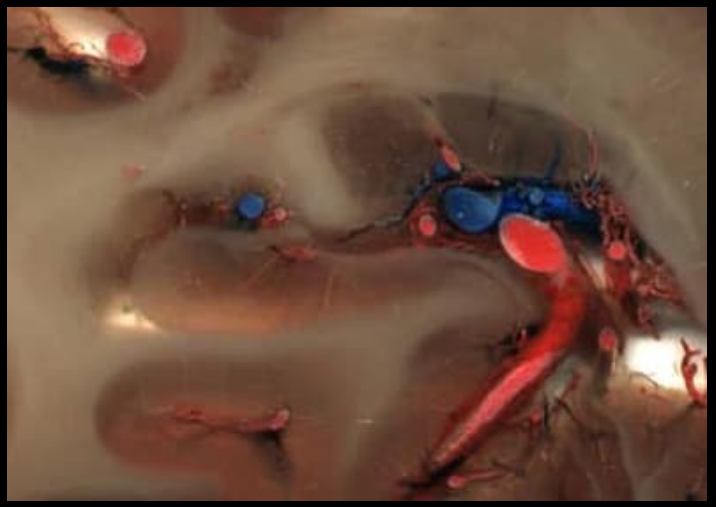
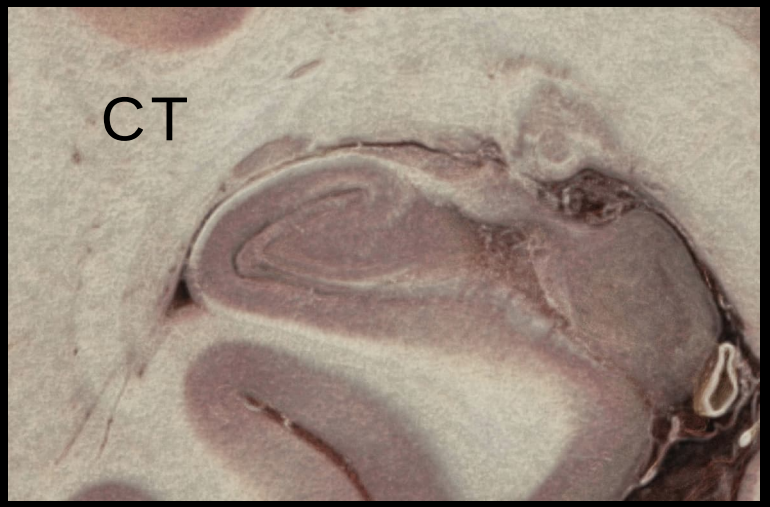
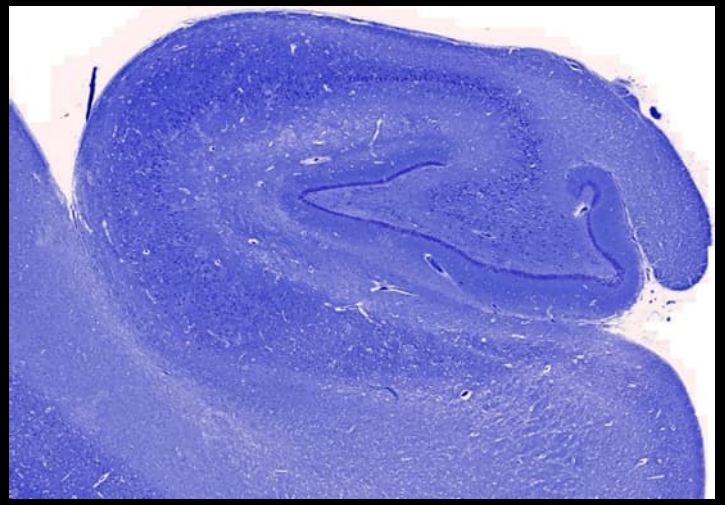
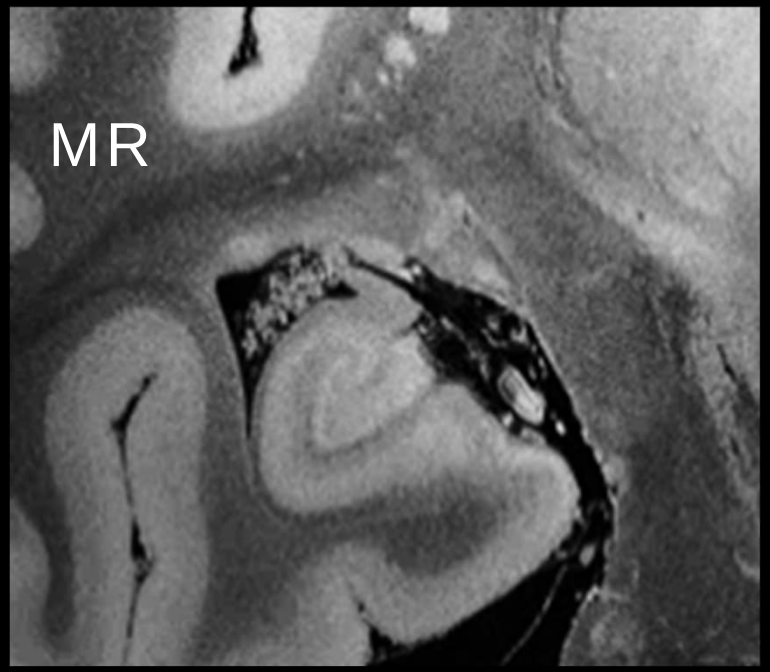
ESRF Grenoble
Klaus Engel
Peter Lee
Claire Walsh
Paul Tafforeau




CT




MR