Workshop „CT made easy“

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Graz – in the Center of Europe

Capital city of Styria
2nd largest city of Austria

Why are you here / expectations?

image quality

patient dose

You need some knowledge about influence of scan parameters on patient dose and image quality.

- **Basics**
- **Planing**
- **Handling**
- **Contrast media**
- **Creativity**
- **Optimaztion**
- **Conclusion**

kV

CTDI

SSDE

DLP

Slice thickness

Patient position

High contrast

Volume

iv.CM Excel sheet

HU treshold

positioning

HSTA

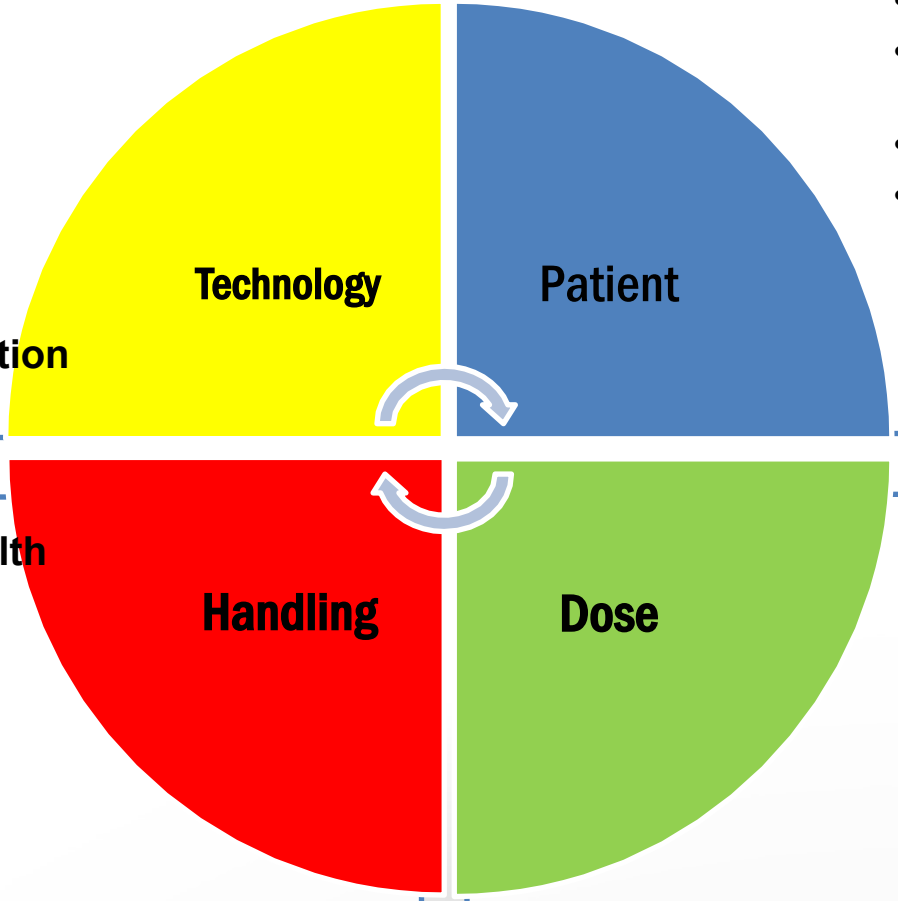
Please stand up:

E.Sorantin is:

A) Aging Rockstart from last millenium

B) Pediatric Radiologist from Graz / A

parameters



- kV
- mAs
- Rotation time
- Pitch
- Kernel
- Slice thickness
- Dose modulation
- Iterative reconstruction

- Medical history
- Indication /clinical question
- Emergency
- Contrast media

- General state of health
- Anaesthesia
- Compliance
- Contrast media
- BMI
- Range

- DRL
- CTDI
- DLP
- Range
- Conversion factor
- Radiation protection
- Contrast media

TARGETS.....

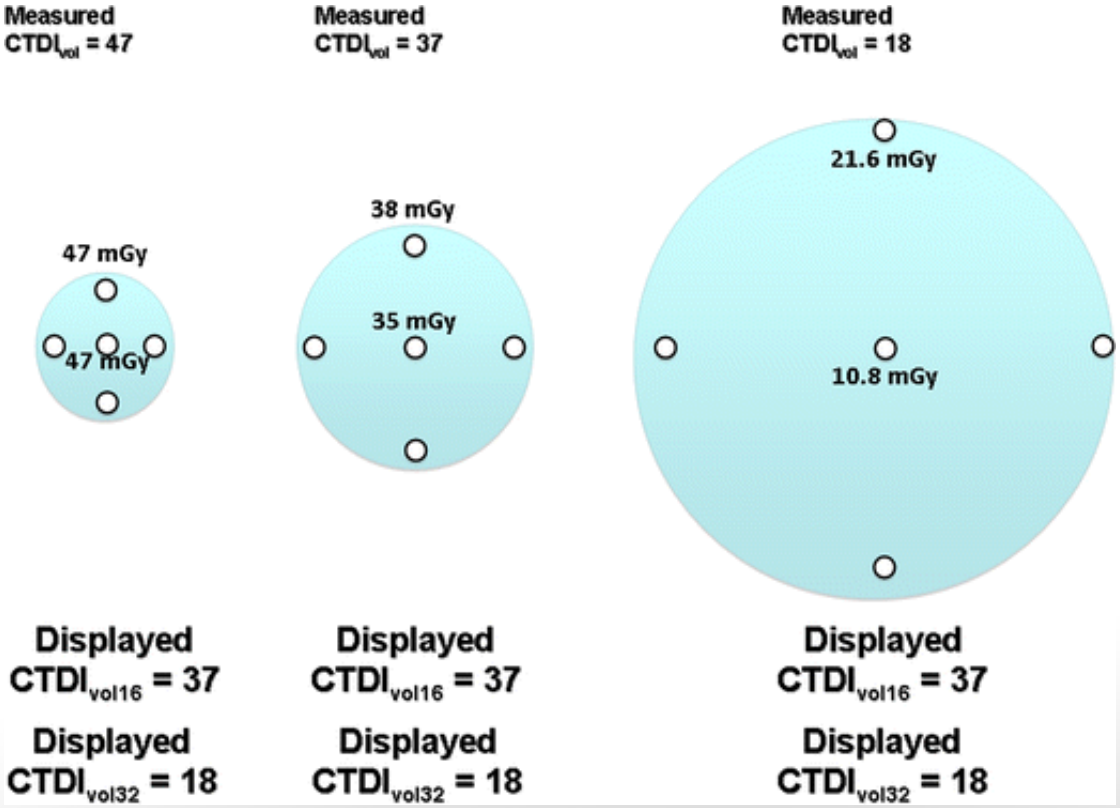
- Patient tailored protocol
  - ALARA
  - Indication
  - Patient body habitus
  - Image Quality (eg noise)
  - Slice thickness
  - CTDI / DLP -> Diagnostic Reference Values

- Tools:
  - Enthusiastic, dedicated, well trained Staff
  - CT Parameter
  - HSTA (Halve Slice Thickness Approach Sorantin)

CTDI – what else?

$$CTDI_w = \frac{1}{3} CTDI_{100}^{central} + \frac{2}{3} CTDI_{100}^{peripheral}$$

Strauss, Goske Pediatr.Radiol 2011



CTDIvol

is a standardized measure of radiation dose output of a CT scanner which allows the user to compare radiation output of different CT scanners

16 cm (HEAD) and 32 cm (BODY) PMMA Phantom with 10cm bar-dosimeter

$CTDI_{vol}$ measures the average dose of a scan volume.

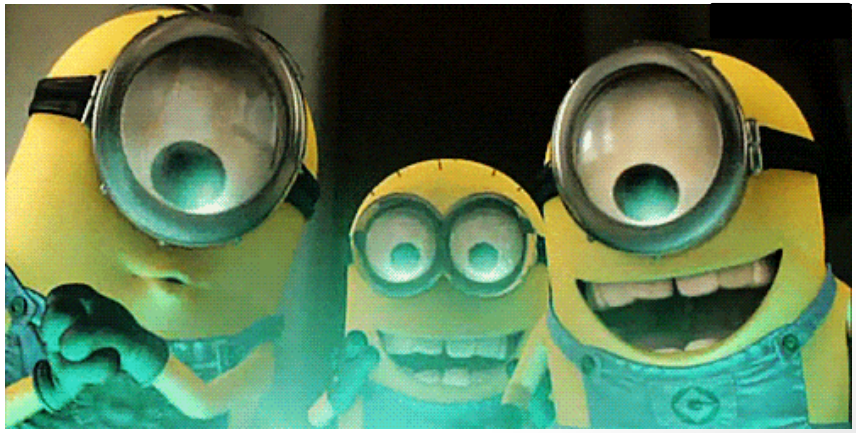
Since 2002 it‘s mandatory to show the $CDTI_{vol}$ on the scanner.

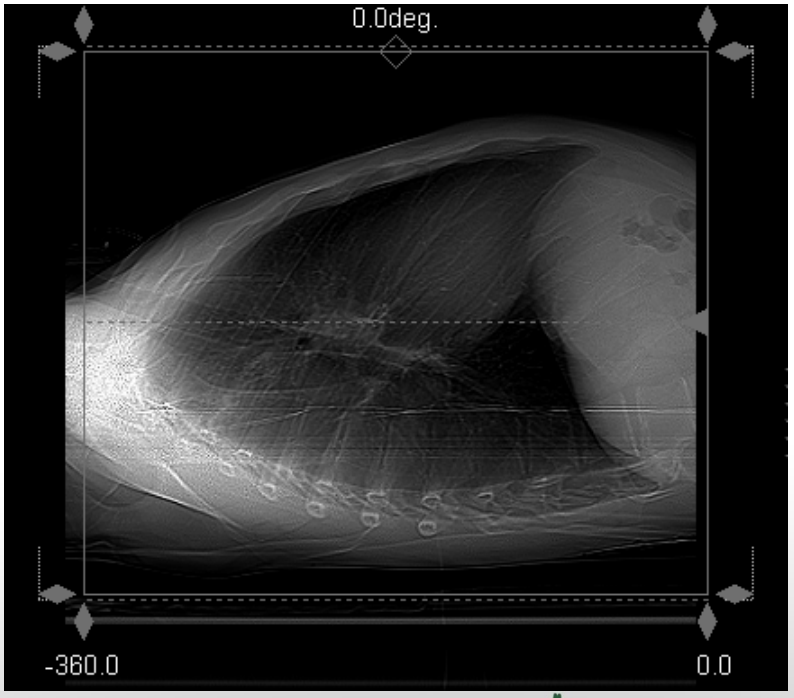
$$CTDI_{vol} = \frac{CTDI_W}{p}$$

dose-length product

is a measure of the x-ray exposure of the patient. It is related to $CTDI_{vol}$, but $CTDI_{vol}$ represents the dose through a slice of an appropriate phantom. DLP accounts for the length of radiation output along the z axis

$$\mathbf{DLP = CTDI_{vol} * Scanlength}$$

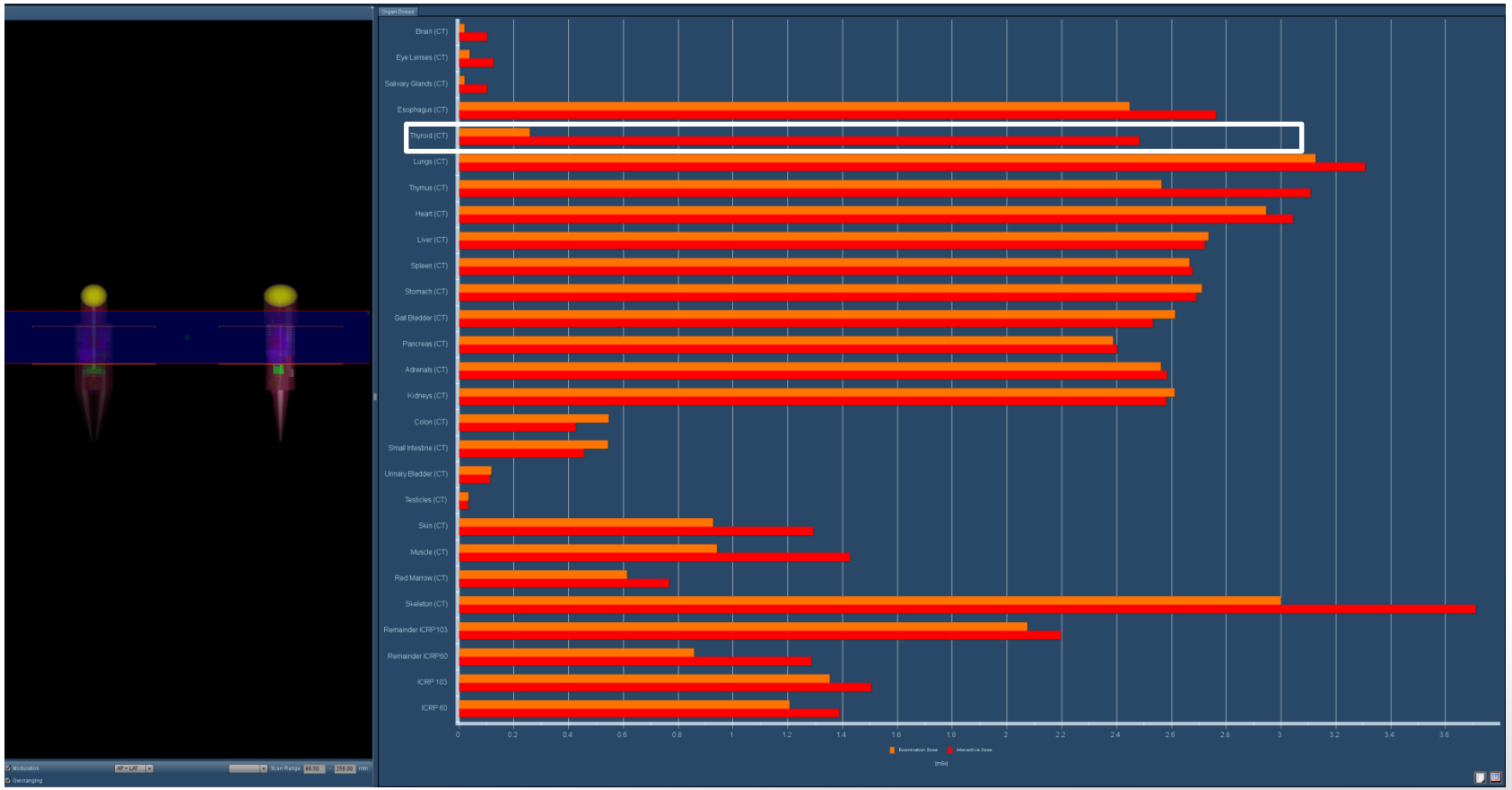




Optimisation CT-Scanlength

MED UNI GRAZ

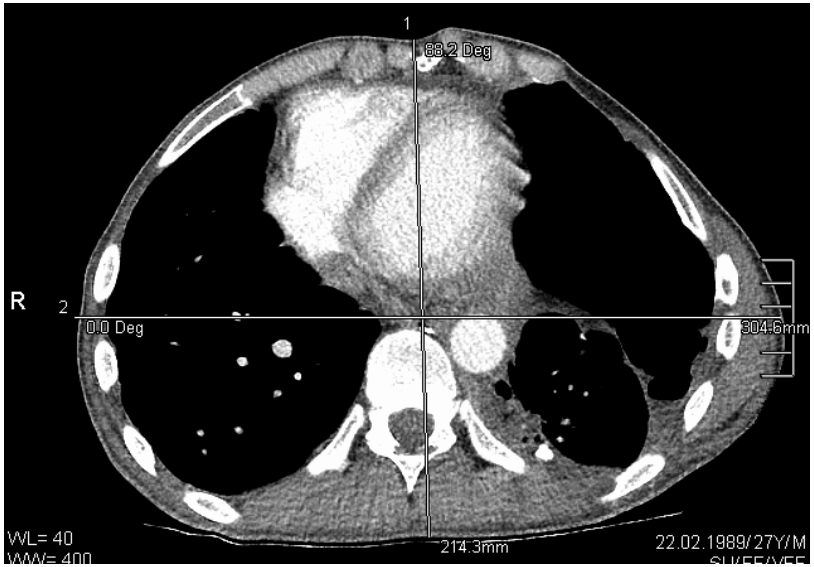
What happens if we don‘t care?



Size spezific dose estimates - SSDE

SSDE is an index of the patient dose

CTDIvol is an index how much dose the scanner applicates



	Size-Specific Dose Estimates (SSDE) (Th. + Abd.)			
	AP(mm)	LAT(mm)	32 PMMA	16 PMMA
			corr.factor	corr.factor
	SUMME(cm)	0,0	#NV	#NV
32 cm PMMA	CTDI vol		SSDE(mGy)	#NV
Faktoren:				
Hals	1,6	Leber	0,8	2,2
Thorax	1,2	Becken	2,2	
Abdomen	2,8	Niere	0,8	4,8

Quelle:AAPM Report 2011

tube voltage

usual 120-140 kV
depends on clinical question
CTAs 80kV or 100kV

kV and dose – quadratic relationship

120kV -> 80kV
Dose reduction $(2/3)^2$= 4/9 = **56%**
120kV -> 100kV
Dose reduction $(5/6)^2$=25/36 = 30%

MED UNI GRAZ

Tube current/tube current-exposure time product

- mAs direct proportional to dose

  Double mAs = double dose to patient

  (same investigation, same ct scanner)

Effective mAs

- eff.mAs = mAs/Pitch
- Dose not equal mAs
- Example: 100 mAs_{eff} with pitch 2 = 200 mAs
  - In modern machines increase of pitch induces mAs adaption in order to maintain image quality → Pitch > 1 dose not automated lead to dose reduction

topogram

- Machine presets are too high - especially in children
- Dose can be 8 times of chest film
- Check influence on automated exposure control
- <u>Suggestion for optimization:</u>

  PA instead AP

  PA and LAT if optimized - no dose increase

Sorantin E, et al. CT in children – dose protection and general considerations when planning a CT in a child. Eur J Radiol (2012), doi:10.1016/j.ejrad.2011.11.041

Kids are special

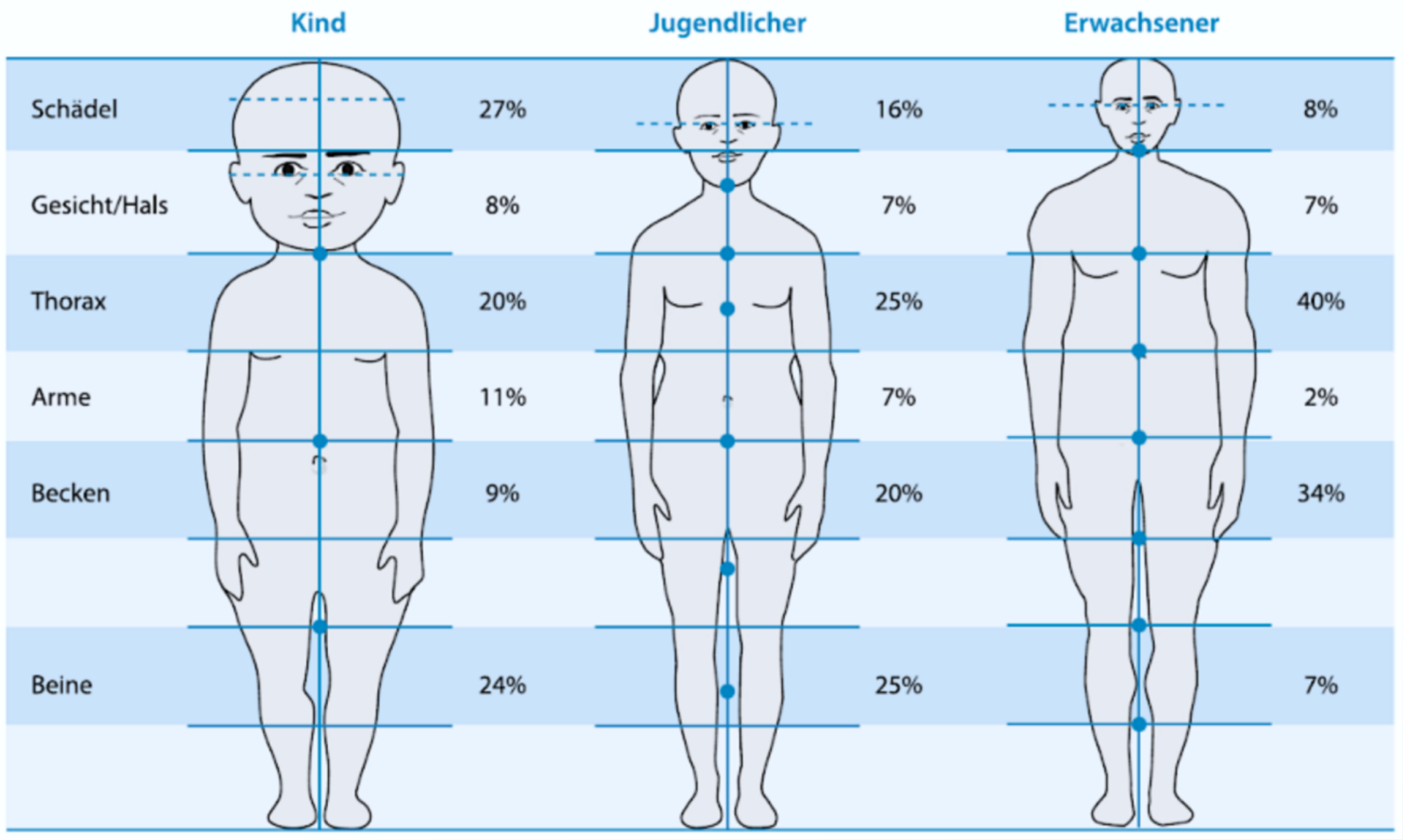
Why do we need different protocols with different parameters?

1

2

- **Varity**
- **Pathology**

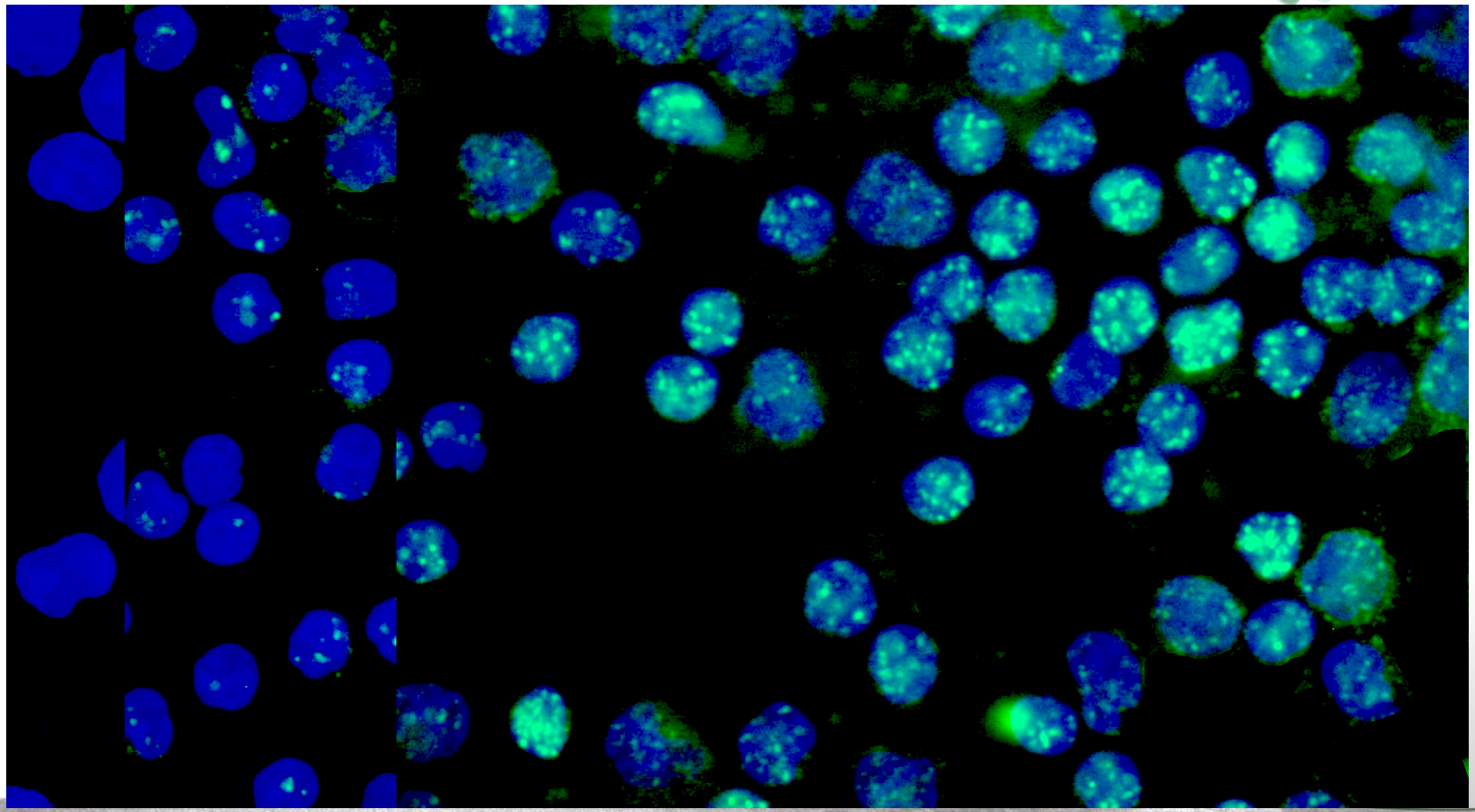
radiosensibility



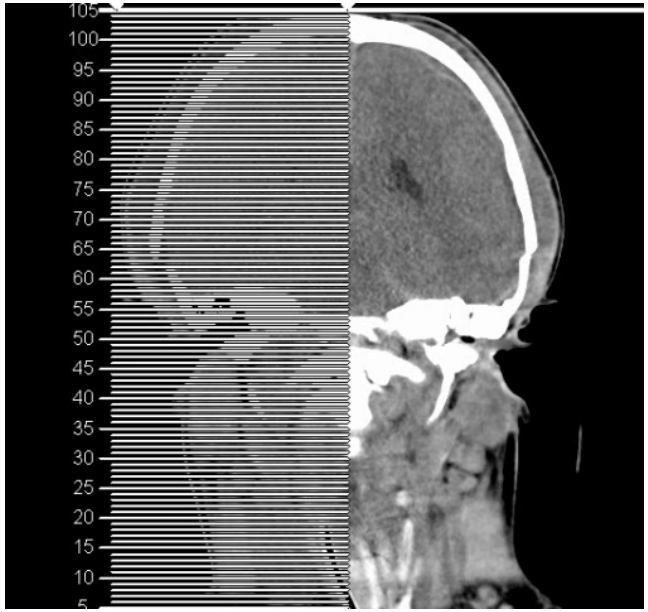
body composition

- less retroperitoneal fat
- metabolism
- low contrast resolution
    - lower image noise – increase dose?

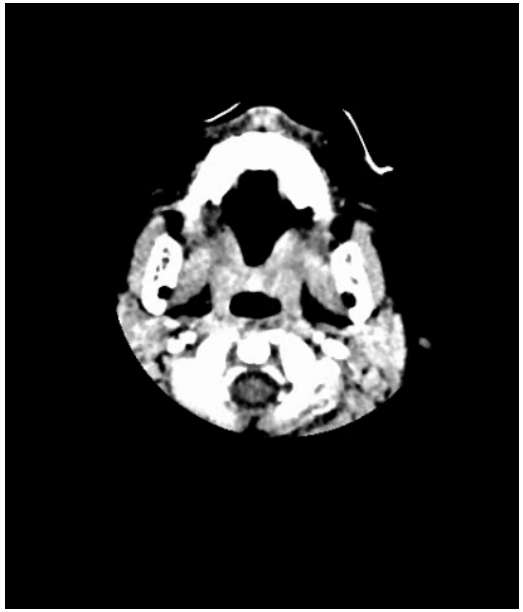
DNA double strain breaks

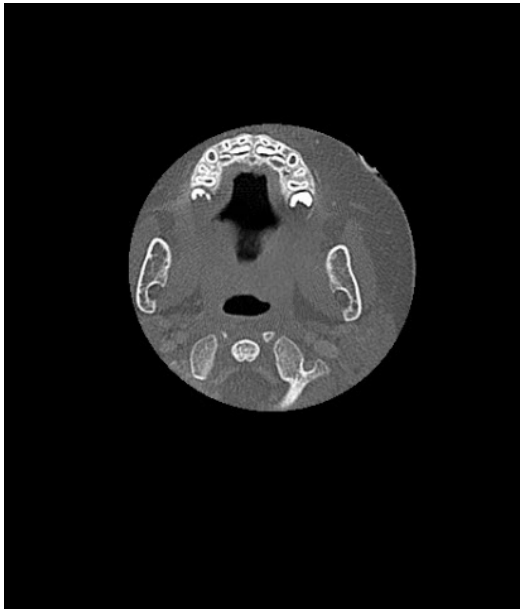


trauma



inner ear





shunt
ventricular size → MRI

trauma

inner ear

Do you use the same protocolls for trauma and inner ear?

YES or NO

Do you need more dose (higher CTDIvol) for the visualisation of the parenchyma or for the bone?

parenchyma or bone

Which organ is a high contrast organ? The other is the low contrast organ!

trauma – parenchyma or inner ear - bone

trauma

inner ear

Slice thickness influences dose

Do you have a thicker slice thickness for the trauma = brain parenchyma
or for the inner ear = bone?

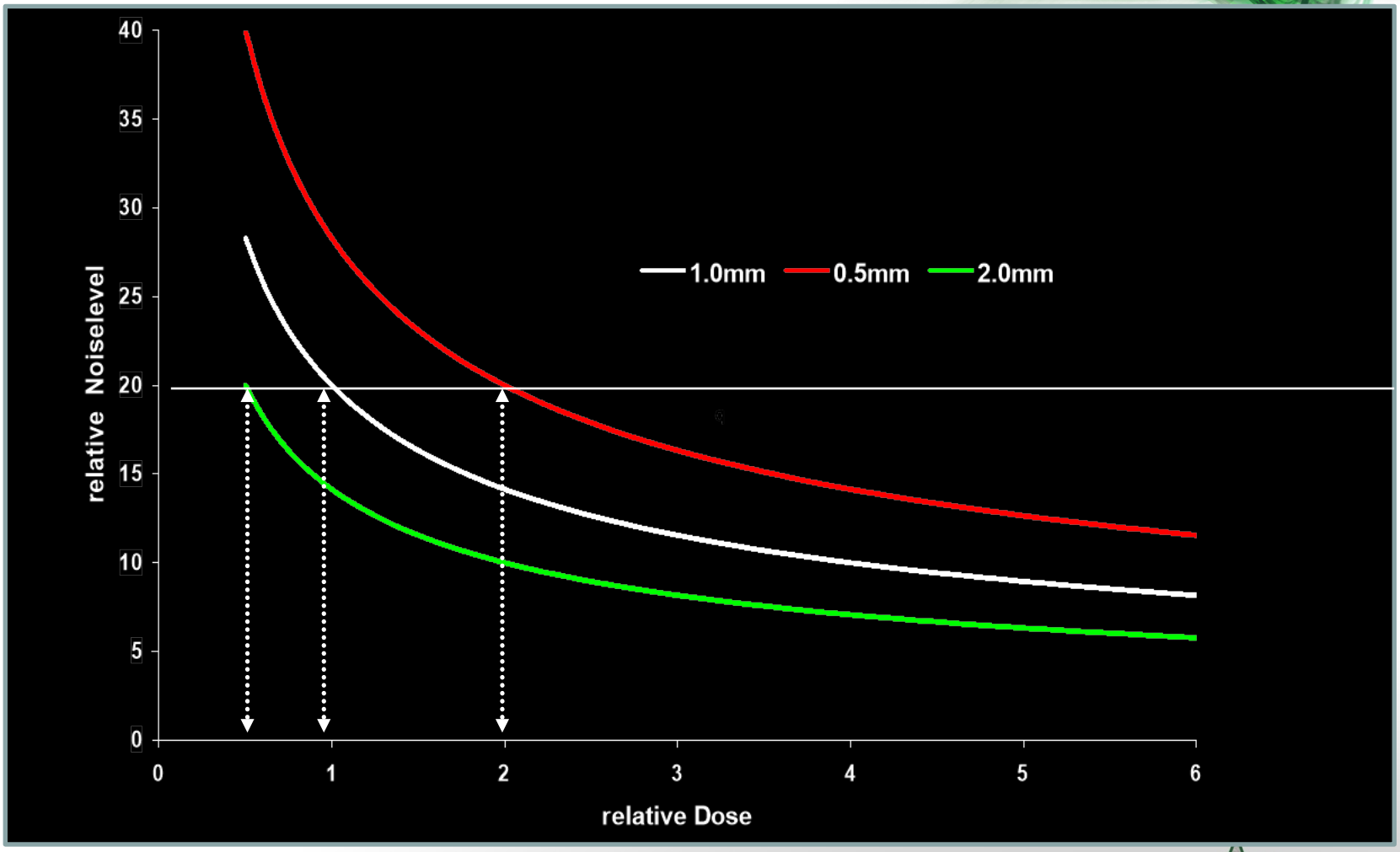
trauma – parenchyma or inner ear - bone

S.th: 5mm
Incr.: 2,5

S.th: 1mm
Incr.: 0,8

Do not forget the increment !!!!!!

Slice thickness - Dose



Shielding Recommendations ICRP

Scenario	Recomm.	Pit falls, disadvantage
“In-plane” shielding (adults and children)	Non-recommended; Optimization with alternative Procedure (eg organ dose modulation)	Quality (noise and artefacts); in-beam shielding could interfere with such systems (AEC)
“In-plane” lens protection	Non-recommended; Optimization with alternative Procedure (eg organ dose modulation)	Quality (noise and artefacts); in-beam shielding could interfere with such systems (AEC)

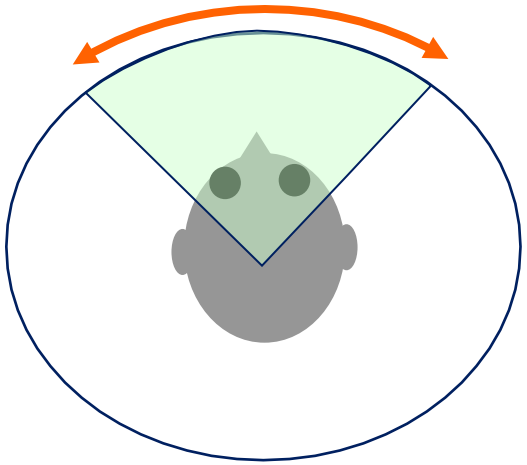
icrp.org

Shielding Recommendations ICRP

Scenario	Recomm	Pit falls, disadvantage
“Out-of-plane” shielding (adults and children)	Non-recommended	• Lead in scout (AEC!!!)
In-plane shielding of gonads	Non-recommended	• Testicles are less radiosensitive (ICRP); • Quality (Ovaries) • No genetic impact

icrp.org

Head: organ dose modulation



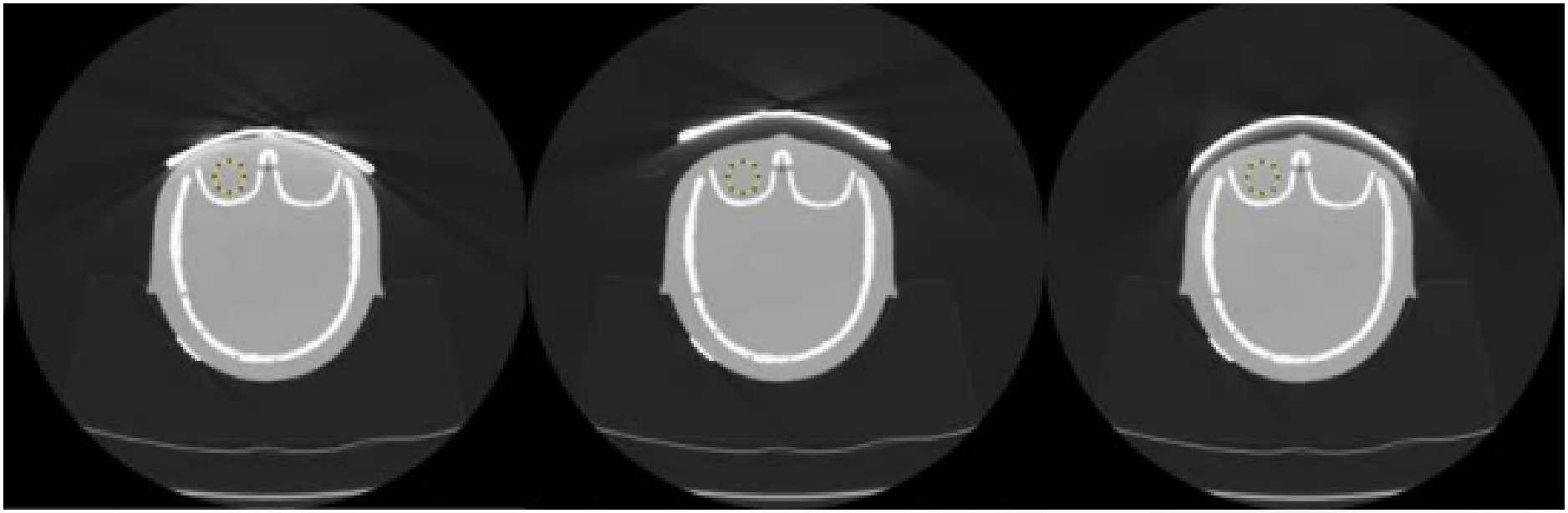
Organ dose modulation allows to reduce direct x-ray exposure for the most dose sensitive body regions f.e. the eye lense through partial scanning.

It protects these areas from direct x-ray exposure by lowering the tube current for a certain range of projections without loss of image quality.

Organ dose modulation reduces the surface dose about 30% (90° anterior)

Quelle: Siemens Healthineers and GE Healthcare

Shielding



Shielding – measurements and results

Dosis pro Scan / mGy	Canon		Canon	
	Volumen		Helix	
	ohne Bi-Sh	mit Bi-Sh	ohne Bi-Sh	mit Bi-Sh
Linse	19	9	22	12
Nasenwurzel	19	10	22	12
Stirn	15	16	19	20
Occiput	12	12	14	15

Dosis pro Scan / mGy	GE		GE		GE		GE	
	Volumen		Helix		Helix, smart mA		Helix, smart mA, ODM	
	ohne Bi-Sh	mit Bi-Sh	ohne Bi-Sh	mit Bi-Sh	ohne Bi-Sh	mit Bi-Sh	ohne Bi-Sh	mit Bi-Sh
Linse	11	7	16	9	19	10	12	7
Nasenwurzel	12	7	17	8	18	9	11	7
Stirn	11	12	15	14	18	17	11	11
Occiput	7	7	11	10	13	12	10	11

Dosis pro Scan / mGy	Siemens		Siemens		Siemens	
	Helix		Helix, x-care 4D		Helix, x-care 4D, x-care	
	ohne Bi-Sh	mit Bi-Sh	ohne Bi-Sh	mit Bi-Sh	ohne Bi-Sh	mit Bi-Sh
Linse	19	13	14	11	10	8
Nasenwurzel	18	13	14	10	10	9
Stirn	17	18	13	14	11	13
Occiput	15	16	21	22	12	11

trauma

inner ear

Computed tomography			
Exam	Age or weight group	EDRL	
		$CTDI_{vol}$, mGy	DLP, mGy cm
Head	0-<3 months	24	300
	3 months-<1 y	28	385
	1-<6 y	40	505
	≥6 y	50	650

Table 10.2b. European DRLs for computed tomography. EDRLs for head CT refer to 16 cm phantom and EDRLs for thorax and abdomen for 32 cm phantom. DRLs refer to a complete routine CT examination (one scan series).

trauma

inner ear

Austrian DRL

Tabelle 8: Diagnostische Referenzwerte für CT-Untersuchungen am Kind

Untersuchungsregion	Gewichts- bzw. Altersklasse	$CTDI_{vol}$[10] [mGy]	DLP[10] [mGy·cm]
Hirnschädel[12]	Säugling (3 bis < 12 Monate)	30	300
	Kleinkind (1 bis < 5 Jahre)	35	450
	Grundschulkind (5 bis < 10 Jahre)	50	650
	Jugendlicher (10 bis < 15 Jahre)	55	800
Thorax	Neugeborenes (3 bis < 5 kg; 0 bis < 3 Monate)	1,0	15
	Säugling (5 bis < 10 kg; 3 bis < 12 Monate)	1,7	25
	Kleinkind (10 bis < 19 kg; 1 bis < 5 Jahre)	2,6	55
	Grundschulkind (19 bis < 32 kg; 5 bis < 10 Jahre)	4,0	110
	Jugendlicher (32 bis < 56 kg; 10 bis < 15 Jahre)[13]	6,5	200
Abdomen	Grundschulkind (19 bis < 32 kg; 5 bis < 10 Jahre)	5,0	185
	Jugendlicher (32 bis < 56 kg; 10 bis < 15 Jahre)	7,0	310

[12] Die angegebenen $CTDI_{vol}$- und DLP-Werte für Untersuchungen am Hirnschädel beziehen sich auf den 16 cm-CTDI-Prüfkörper („Kopfphantom"). Die anderen Untersuchungen auf den 32 cm-Prüfkörper („Körperphantom").

[13] Bei Kindern/Jugendlichen dieser Altersgruppe können je nach Wachstumsschub die Thoraxlängen (Körpergrößen) sehr stark variieren, so dass in Einzelfällen auch bei eingehaltenen $CTDI_{vol}$-Wert der DLP-Wert überschritten sein kann.

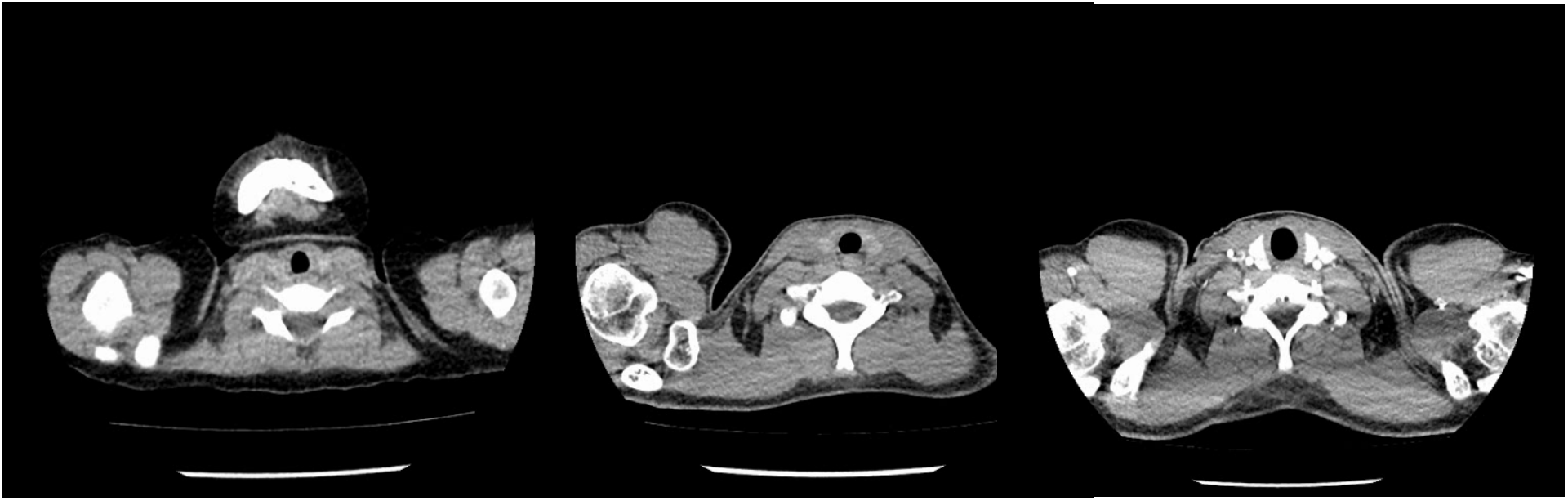
Interventionelle Röntgenanwendungen
Vom 22. Juni 2016

chest

follow-up

PAE

CTA



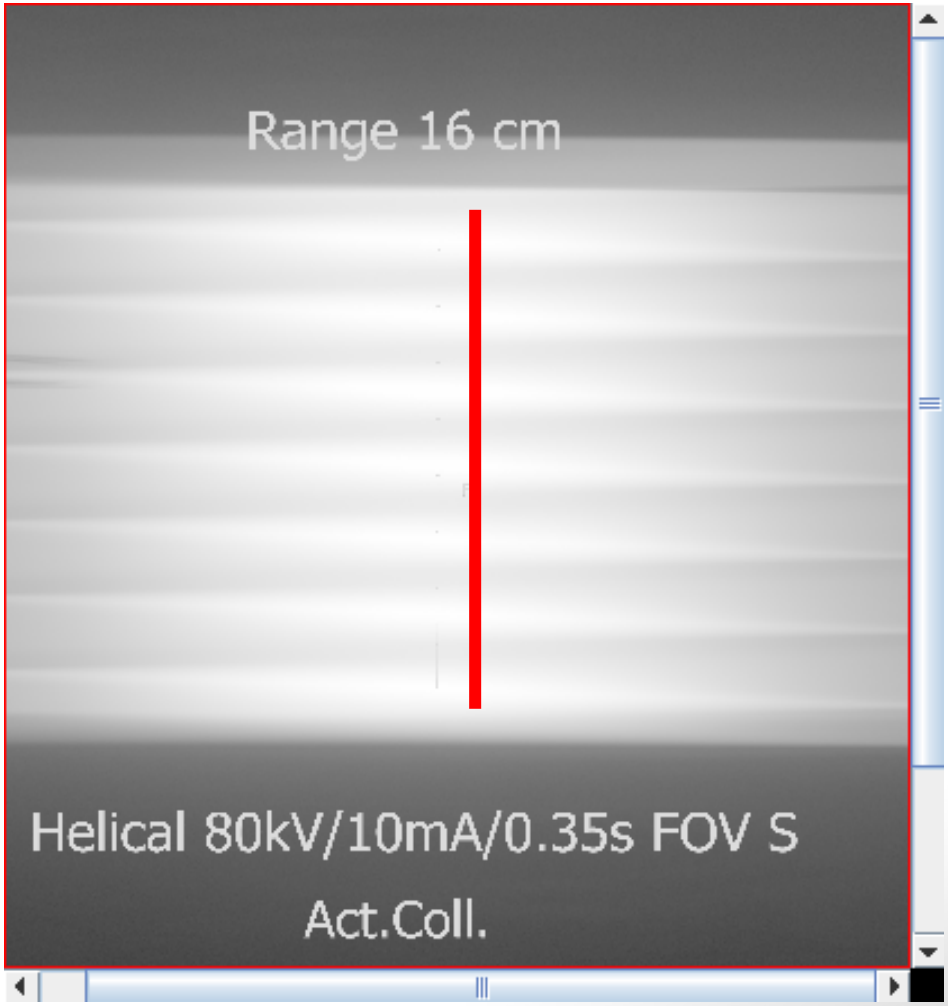
~~Sequence mode~~

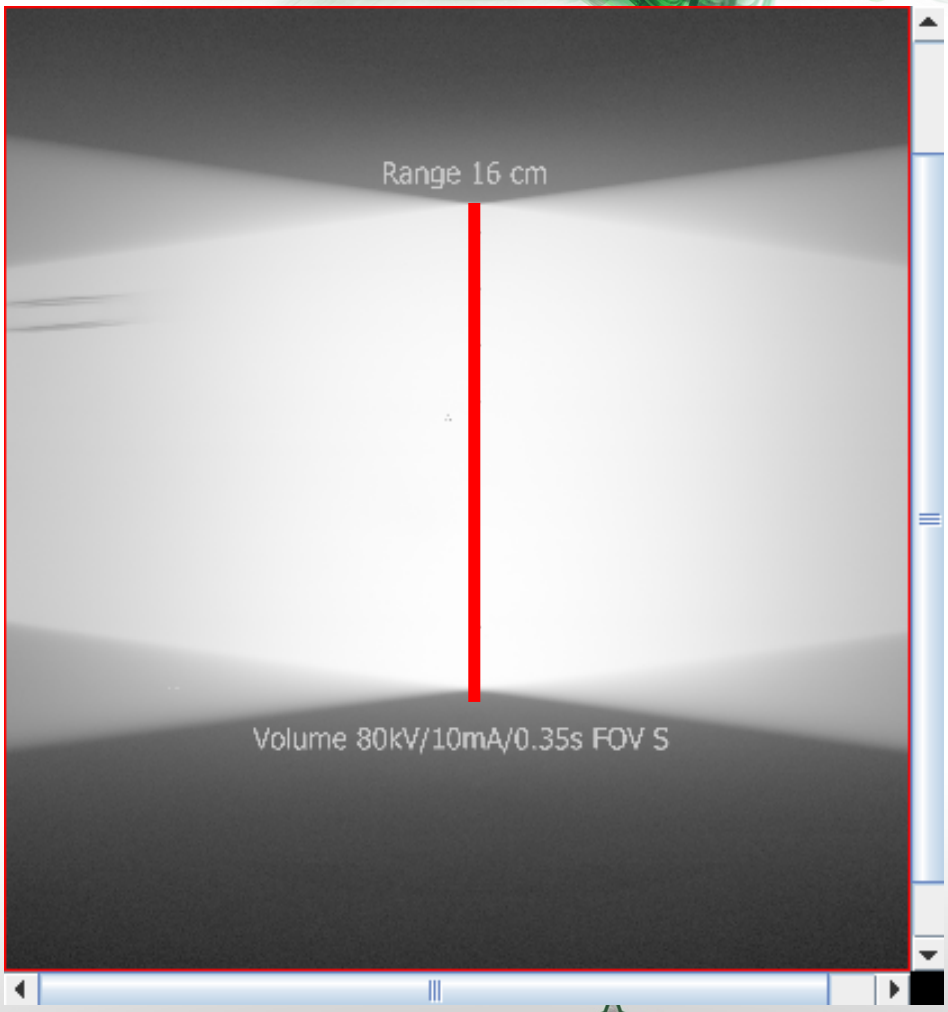
Imag. Chain: technic

Scanmode		*DLPc*
Helical (0.5 x 32)	**Scanlength 4.0cm**	**161%**
Helical (0,5 x 64)	**Scanlength 4.0cm**	**182%**
Volume	**Scanlength 4.0cm**	**100%**
Sequence	**40 x 1.0mm**	**541%**

CT-Phantom 32cm, DLPc =Center dose, PTW-Chamber 9001 – 10cm, 120 kV, 160 mAs eff,
UDoz.Dr.Mag.Stücklschweiger / Mag. Guss, Strahlenschutzstelle Univ.-Klinikum Graz

Overranging/beaming





follow-up

PAE

CTA

Do you use the same protocolls for a Onco follow up, PAE and a CTA?

YES or NO

Is the lung a high or a low contrast organ?

HIGH or LOW

Do you have the same slice thickness for all the three examinations?

YES or NO

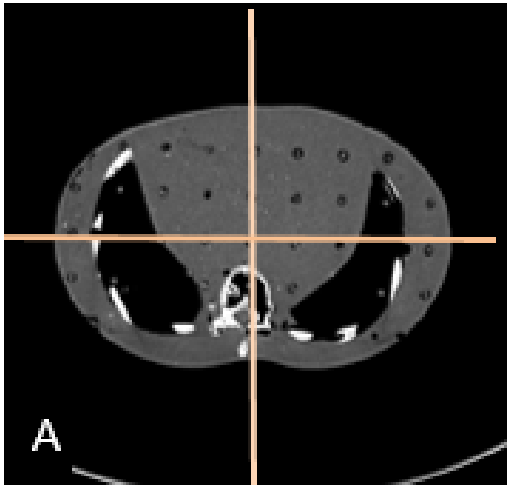
S.th: 3mm
Incr.: 1.5

S.th: 2mm
Incr.: 1,5

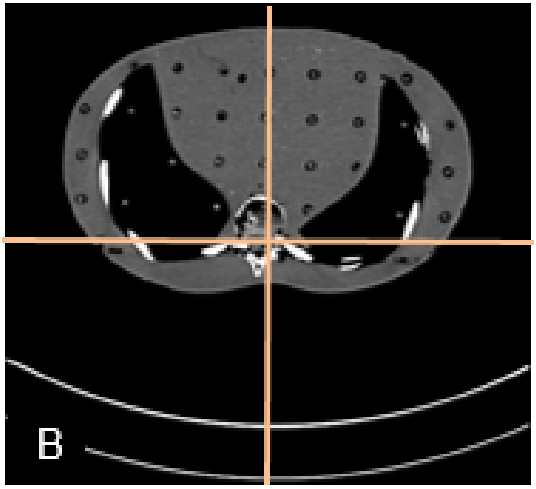
S.th: 3mm
Incr.: 1,5

Experiential study

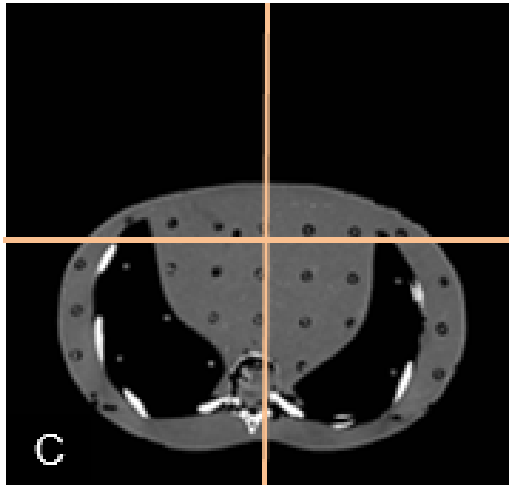
We measured the effective dose on different vertical positions in relation to the isocenter.



A: Isocenter

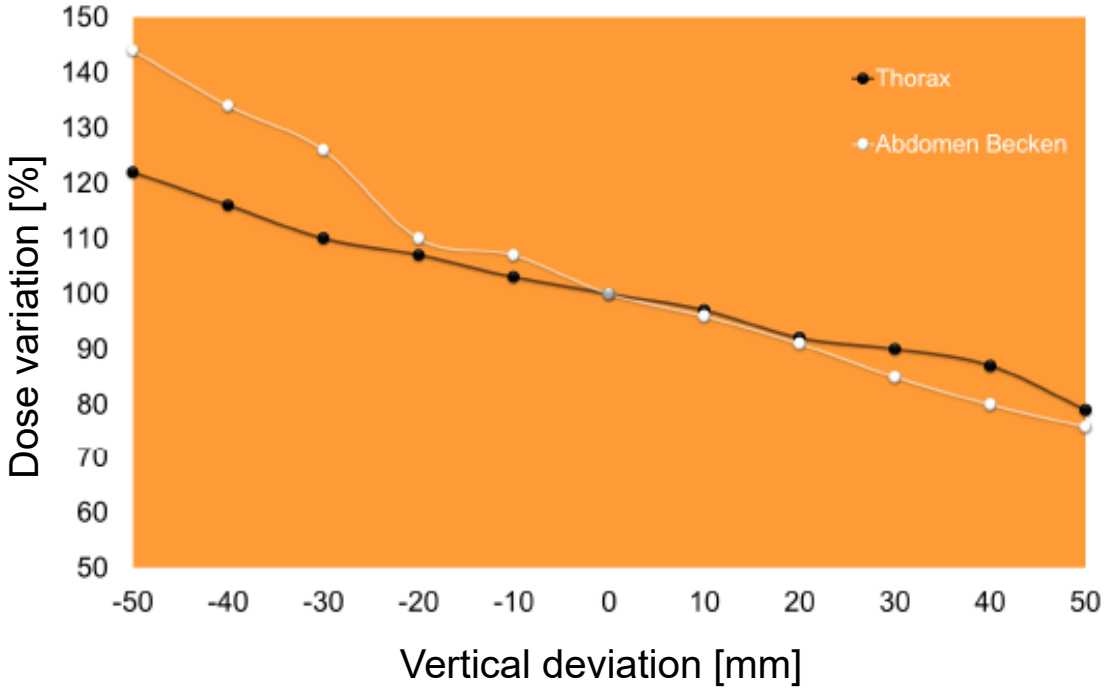


B: deviation +50 mm

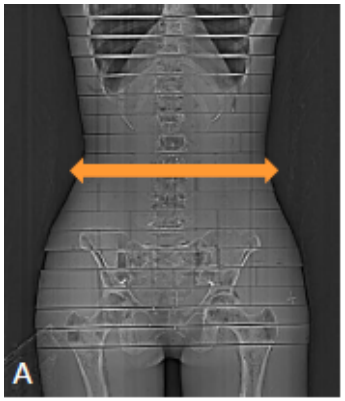


C:deviation -50 mm

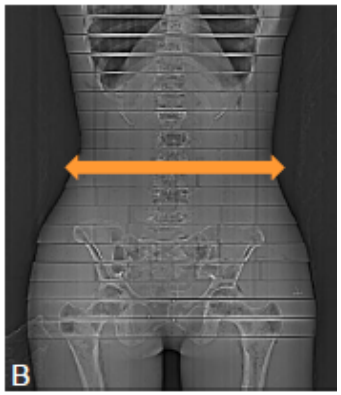
Deviation of + 50 mm and -50 mm implicates a dose variation of 56%



Reason: changed focus-object distance
Object appears bigger or smaller



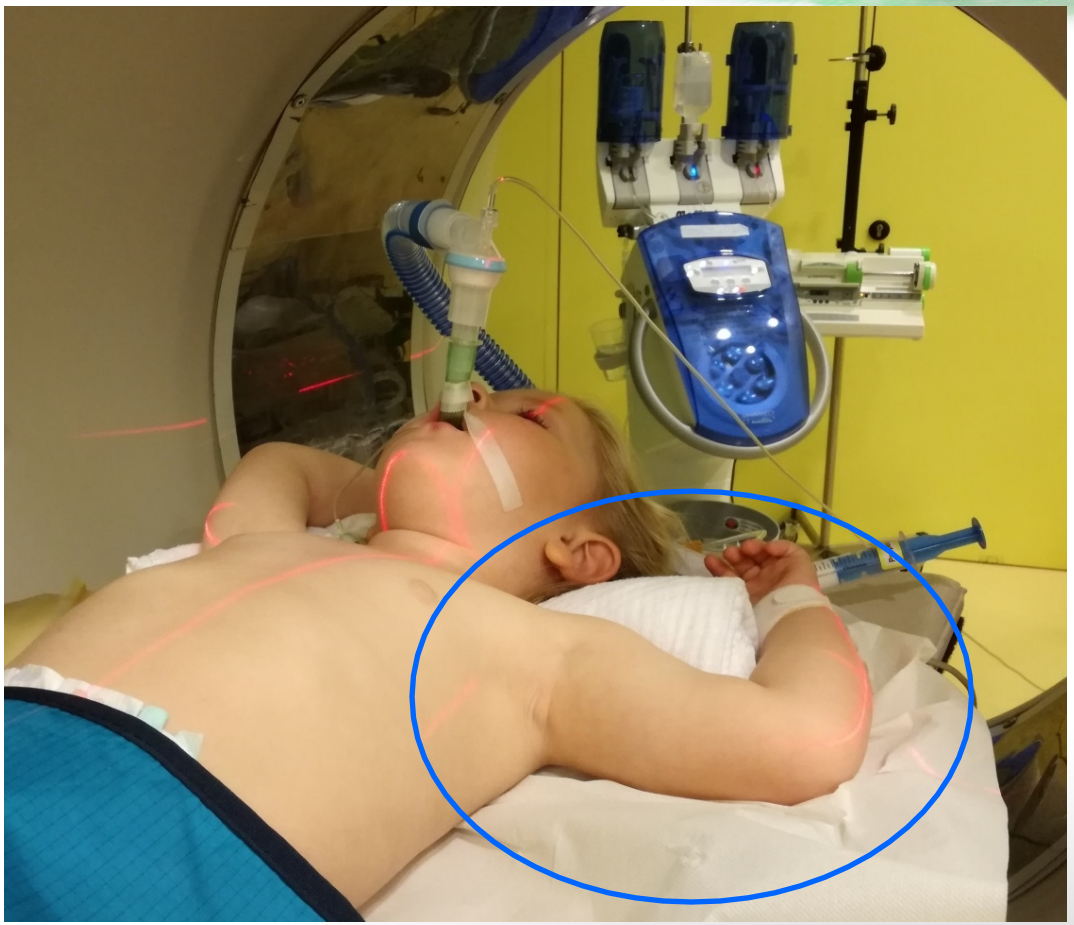
A: isocenter



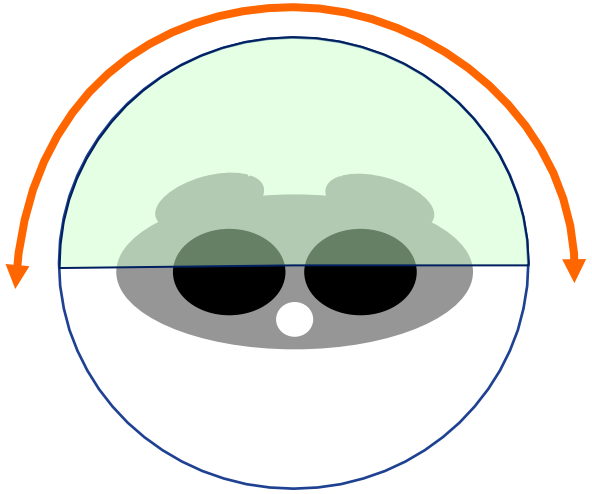
B: deviation +50mm

C: deviation -50mm

Sidestep: positioning



Thorax: organ dose modulation

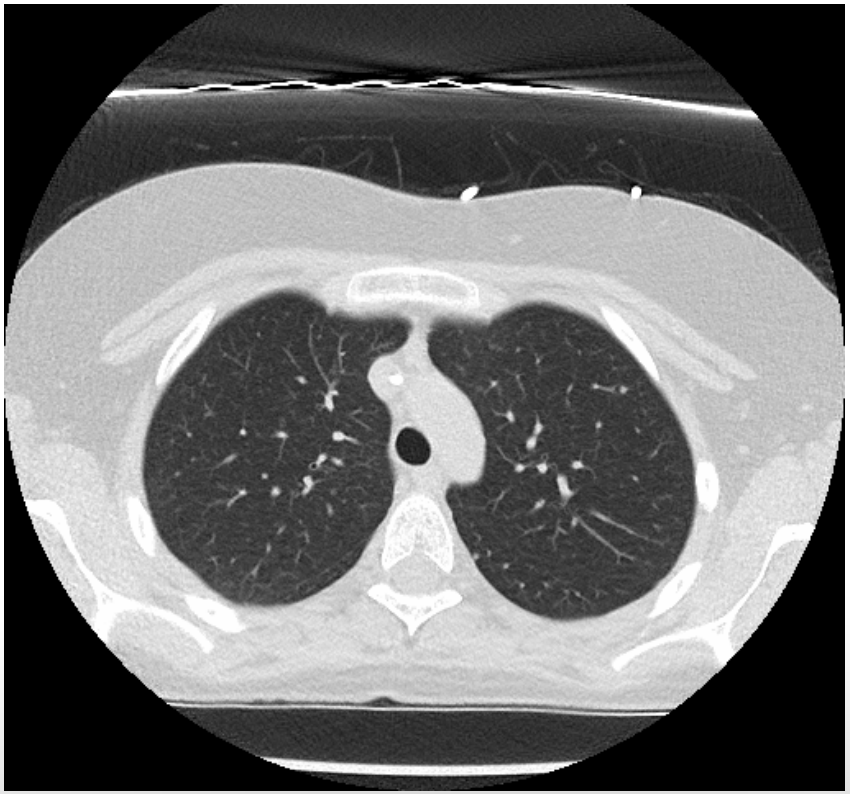


Organ dose modulation reduces the surface dose about 40% (180° anterior)

CAVE: patient have to be positioned at the center of the Scan Field of View!!!!

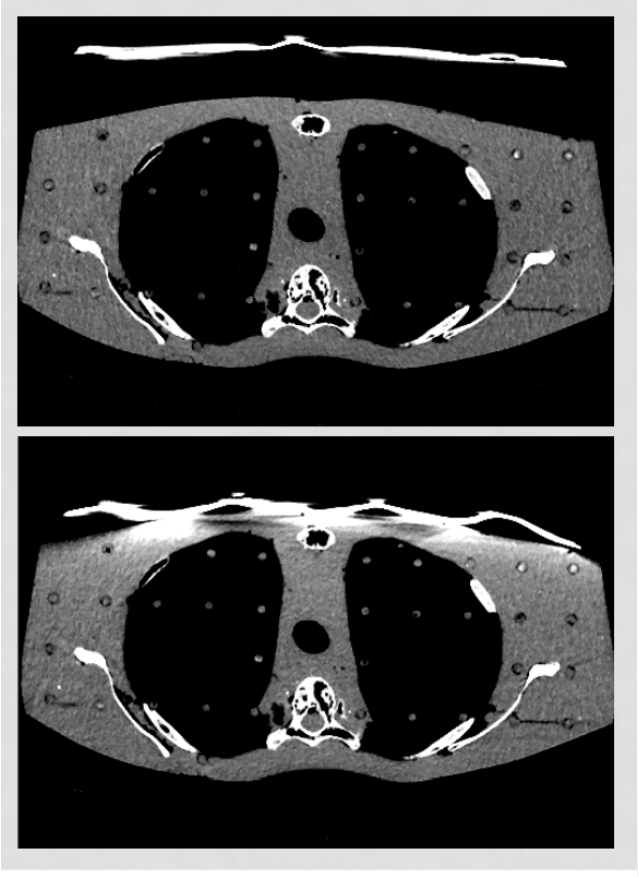
Quelle: Siemens Healthineers and GE Healthcare

breast-shielding



Surface dose ↓
Protection for the mammary
& thyroid gland

Shielding



With foam material

Without foam material

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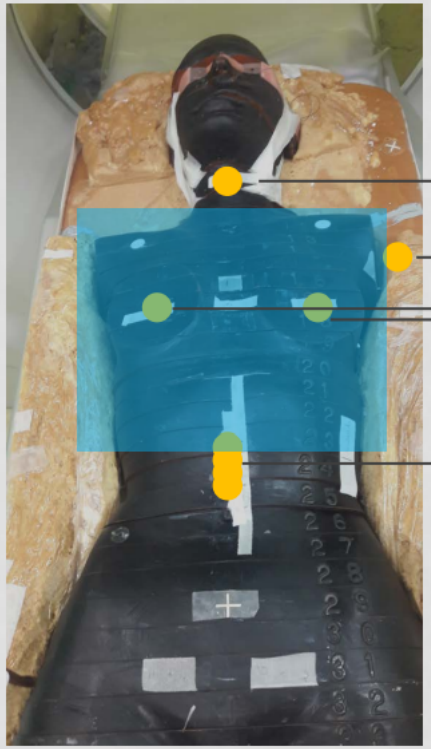
Measurements with an Alderson phantom



Shielding - results

Canon

Dosis pro Scan in mGY	ohne Bi	mit Bi
Schilddrüse	1,8	1,4
Mamma (li+re)	3,4	1,8
Körperseite links	3,0	2,3

GE without ODM

Dosis pro Scan in mGY	ohne Bi	mit Bi
Schilddrüse	3,7	3,3
Mamma (li+re)	3,0	1,7
Körperseite links	2,6	2,2

GE with ODM

Dosis pro Scan in mGY	ohne Bi	mit Bi
Schilddrüse	5,8	4,1
Mamma (li+re)	4,1	2,6
Körperseite links	4,0	3,2

Siemens without x-care

Dosis pro Scan in mGY	ohne Bi	mit Bi
Schilddrüse	2,5	2,8
Mamma (li+re)	3,5	2,6
Körperseite links	3,7	3,2

Siemens with x-care

Dosis pro Scan in mGY	ohne Bi	mit Bi
Schilddrüse	3,7	2,7
Mamma (li+re)	5,3	3,7
Körperseite links	6,3	5,6

Computed tomography			
Exam	Age or weight group	EDRL	
		$CTDI_{vol}$, mGy	DLP, mGy cm
Thorax	<5 kg	1,4	35
	5-<15 kg	1,8	50
	15-<30 kg	2,7	70
	30-<50 kg	3,7	115
	50-<80 kg	5,4	200

Table 10.2b. European DRLs for computed tomography. EDRLs for head CT refer to 16 cm phantom and EDRLs for thorax and abdomen for 32 cm phantom. DRLs refer to a complete routine CT examination (one scan series).

Follow up

PAE

CTA

Austrian DRL

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	Kleinkind (10 bis < 19 kg; 1 bis < 5 Jahre)	2,6	55
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	Jugendlicher (32 bis < 56 kg; 10 bis < 15 Jahre)[13]	6,5	200
Abdomen	Grundschulkind (19 bis < 32 kg; 5 bis < 10 Jahre)	5,0	185
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[12] Die angegebenen $CTDI_{vol}$- und DLP-Werte für Untersuchungen am Hirnschädel beziehen sich auf den 16 cm-CTDI-Prüfkörper („Kopfphantom"). Die anderen Untersuchungen auf den 32 cm-Prüfkörper („Körperphantom").

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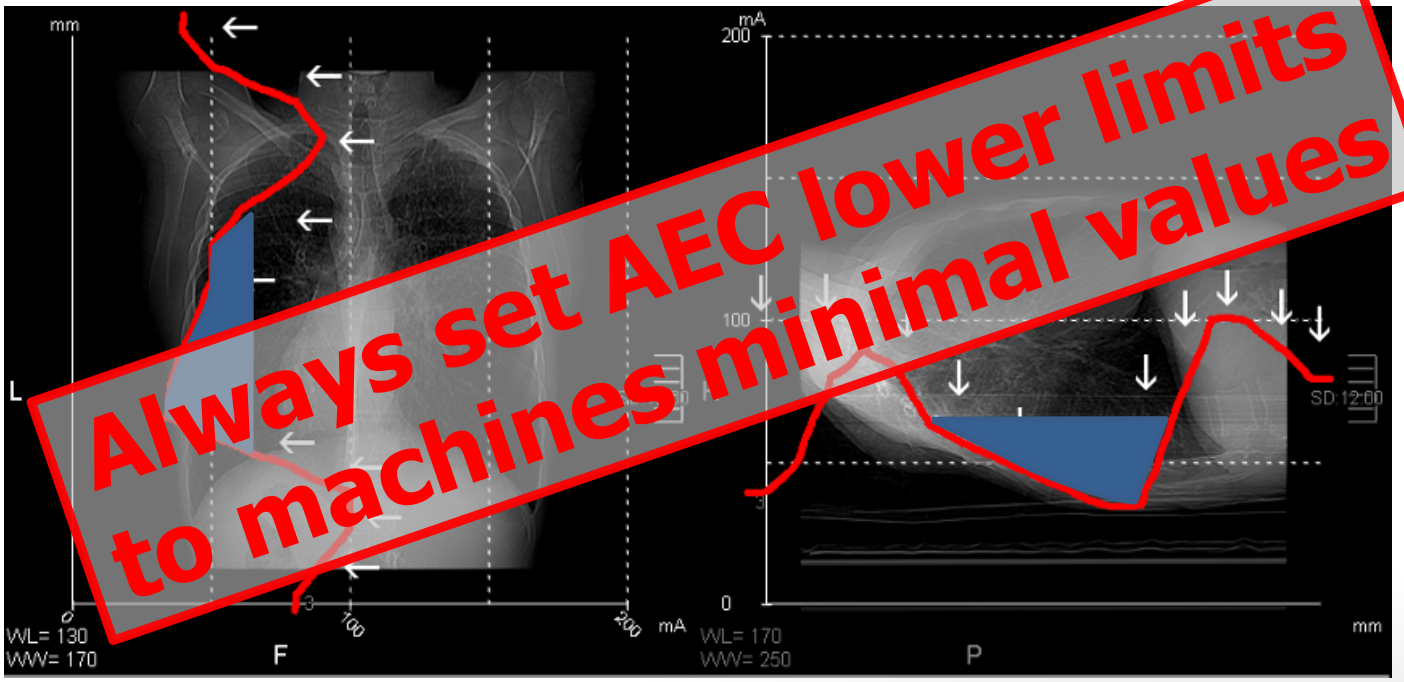
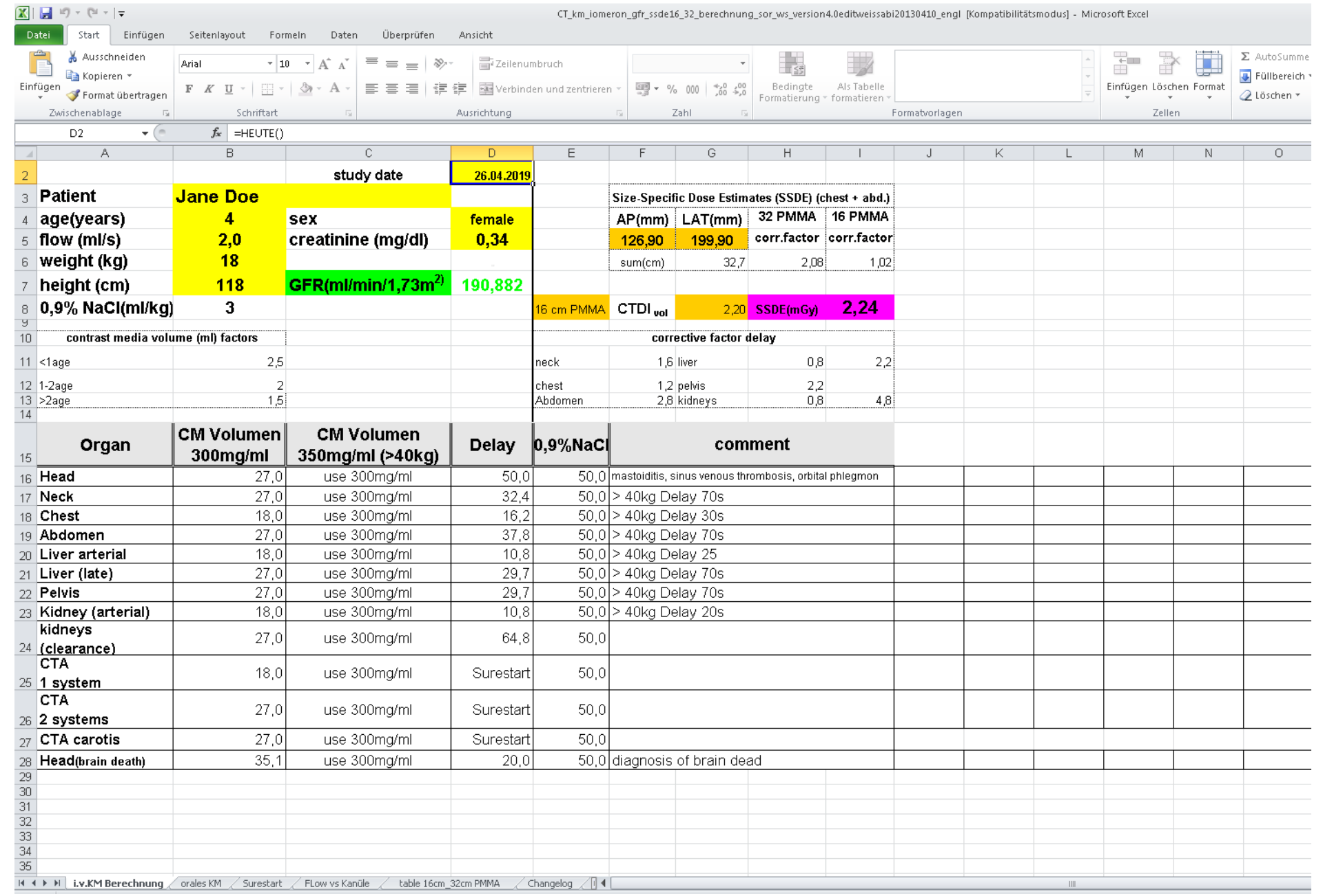
Quelle: Bundesamt für Strahlenschutz
Bekanntmachung der aktualisierten diagnostischen Referenzwerte für diagnostische und interventionelle Röntgenanwendungen
Vom 22. Juni 2016

Automated exposure settings

Check the minimum and maximum values for mAs



Excess Dose



CT_km_iomeron_gfr_ssde16_32_berechnung_sor_ws_version4.0editweissabi20130410_engl [Kompatibilitätsmodus] - Microsoft Excel

Datei | Start | Einfügen | Seitenlayout | Formeln | Daten | Überprüfen | Ansicht

Einfügen | Ausschneiden | Kopieren | Format übertragen | Zwischenablage
Arial | 10 | Schriftart
Zeilenumbruch | Verbinden und zentrieren | Ausrichtung
Zahl
Bedingte Formatierung | Als Tabelle formatieren | Formatvorlagen
Einfügen | Löschen | Format | Zellen
AutoSumme | Füllbereich | Löschen

D2 =HEUTE()

	study date	26.04.2019
Patient	Jane Doe	
age(years)	4	sex: female
flow (ml/s)	2,0	creatinine (mg/dl): 0,34
weight (kg)	18	
height (cm)	118	GFR(ml/min/1,73m²): 190,882
0,9% NaCl(ml/kg)	3	

Size-Specific Dose Estimates (SSDE) (chest + abd.)			
	AP(mm)	LAT(mm)	32 PMMA corr.factor	16 PMMA corr.factor
	126,90	199,90		
sum(cm)	32,7	2,08	1,02
16 cm PMMA	CTDI vol	2,20	SSDE(mGy)	2,24

contrast media volume (ml) factors	
<1age	2,5
1-2age	2
>2age	1,5

corrective factor delay				
neck	1,6	liver	0,8	2,2
chest	1,2	pelvis	2,2	
Abdomen	2,8	kidneys	0,8	4,8

Organ	CM Volumen 300mg/ml	CM Volumen 350mg/ml (>40kg)	Delay	0,9%NaCl	comment
Head	27,0	use 300mg/ml	50,0	50,0	mastoiditis, sinus venous thrombosis, orbital phlegmon
Neck	27,0	use 300mg/ml	32,4	50,0	> 40kg Delay 70s
Chest	18,0	use 300mg/ml	16,2	50,0	> 40kg Delay 30s
Abdomen	27,0	use 300mg/ml	37,8	50,0	> 40kg Delay 70s
Liver arterial	18,0	use 300mg/ml	10,8	50,0	> 40kg Delay 25
Liver (late)	27,0	use 300mg/ml	29,7	50,0	> 40kg Delay 70s
Pelvis	27,0	use 300mg/ml	29,7	50,0	> 40kg Delay 70s
Kidney (arterial)	18,0	use 300mg/ml	10,8	50,0	> 40kg Delay 20s
kidneys (clearance)	27,0	use 300mg/ml	64,8	50,0	
CTA 1 system	18,0	use 300mg/ml	Surestart	50,0	
CTA 2 systems	27,0	use 300mg/ml	Surestart	50,0	
CTA carotis	27,0	use 300mg/ml	Surestart	50,0	
Head(brain death)	35,1	use 300mg/ml	20,0	50,0	diagnosis of brain dead

i.v.KM Berechnung | orales KM | Surestart | FLow vs Kanüle | table 16cm_32cm PMMA | Changelog

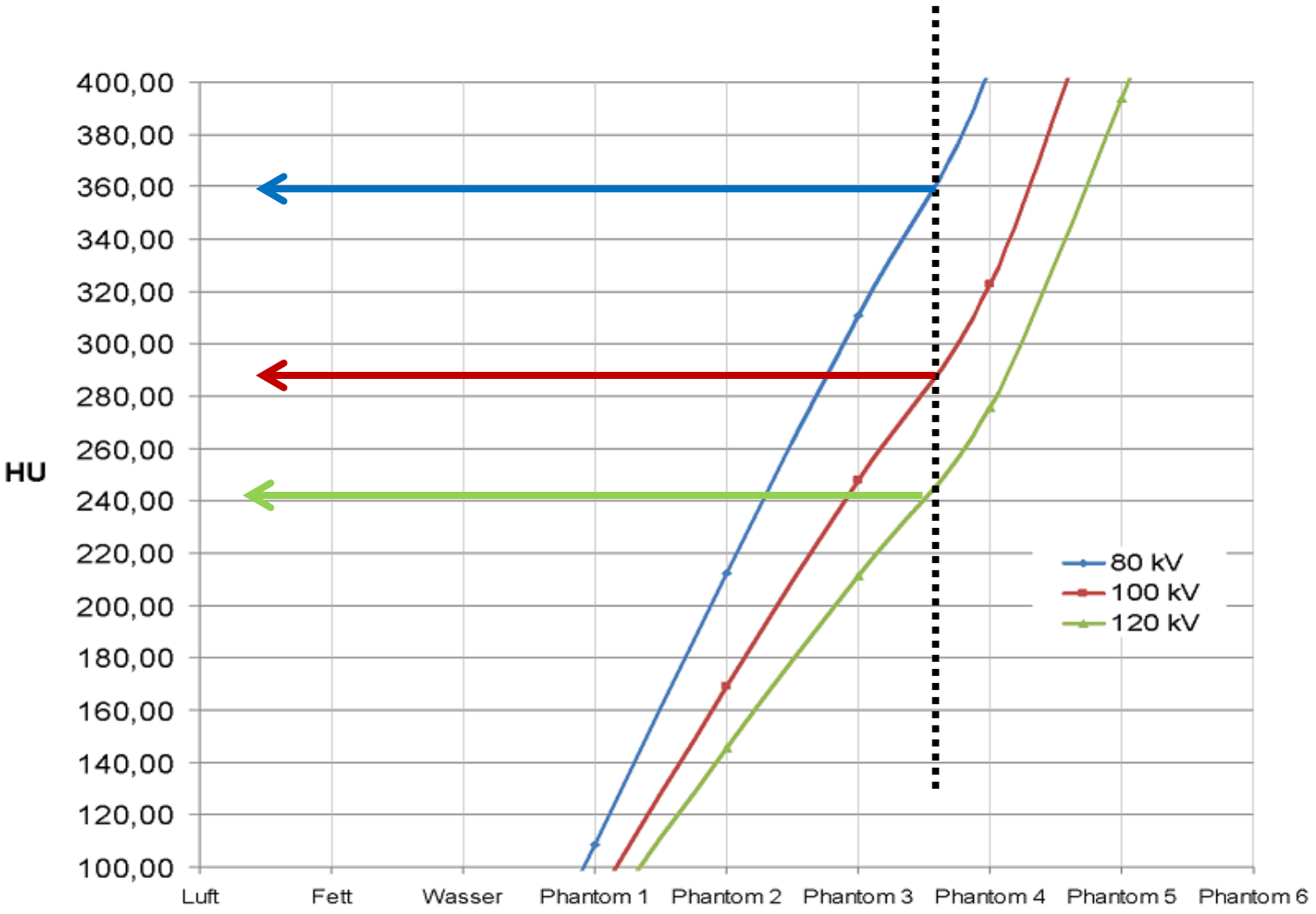
Universitätsklinik für Radiologie
Klinische Abteilung für Kinderradiologie
Leitung: ao.Univ.-Prof. Dr. Erich Sorantin (suppl.)
Leitende Radiologietechnologin Birgit Oppelt, M.A.
Medizinische Universität Graz

relationship between kV and HU-threshold

You have to adapt the HU-threshold,

if you use less kV like 80kV or 100kV

(Depends on your scanner, if it is nessasary or not)


HU
400,00
380,00
360,00
340,00
320,00
300,00
280,00
260,00
240,00
220,00
200,00
180,00
160,00
140,00
120,00
100,00
Luft
Fett
Wasser
Phantom 1
Phantom 2
Phantom 3
Phantom 4
Phantom 5
Phantom 6
80 kV
100 kV
120 kV

Computed mean threshold values

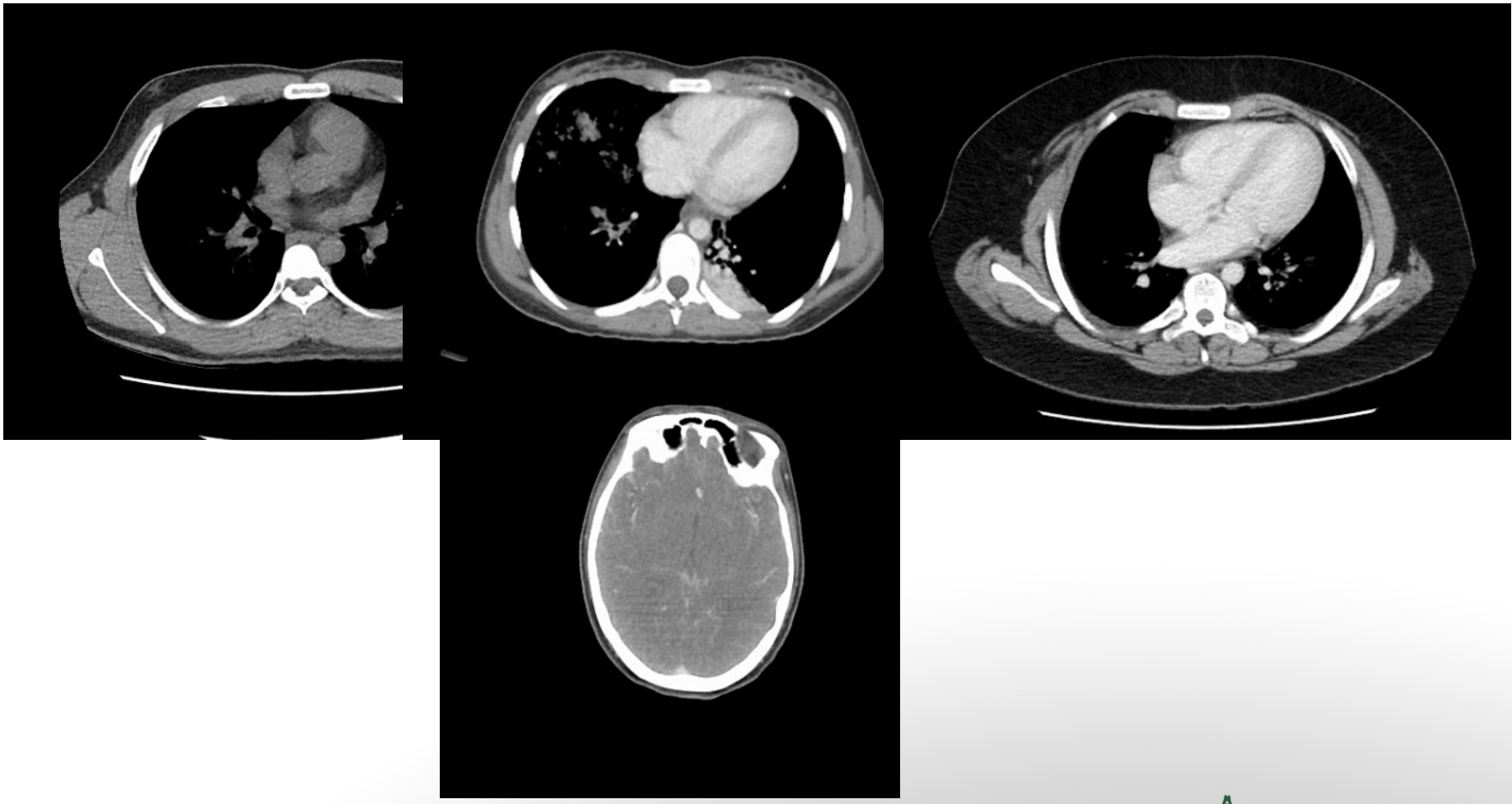
	Reference threshold HU values at 120 kV						
	200 HU	**150 HU**	**120 HU**	**100 HU**	**90 HU**	**80 HU**	**70 HU**
70 kV (n=2)	310	250	210	190	180	160	150
80 kV (n=3)	280	220	190	160	150	140	130
90 kV (n=1)	240	190	160	140	120	110	100
100 kV (n=3)	220	170	140	120	110	100	90
110 kV (n=1)	210	160	130	110	100	90	80
120 kV (n=3)	200	150	120	100	90	80	70
130 kV (n=1)	180	140	110	90	80	70	60
135 kV (n=1)	180	140	110	90	80	70	60
140 kV (n=2)	175	130	100	85	80	70	60

abdomen

nephrolitiasis

trauma

appendicitis



nephrolitiasis

trauma

appendicitis

Do you use the same protocolls for a nephrolitiasis, trauma and appendicitis?

YES or NO

Is the abdomen a high or a low contrast organ?

HIGH or LOW

Do you have the same slice thickness for all the three examinations?

YES or NO

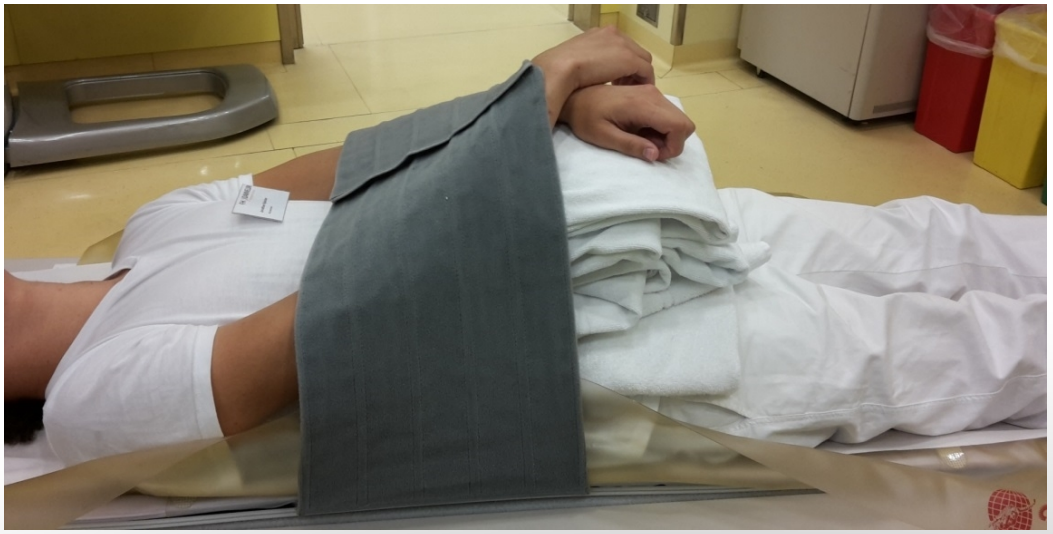
S.th: 3mm
Incr.: 1.5

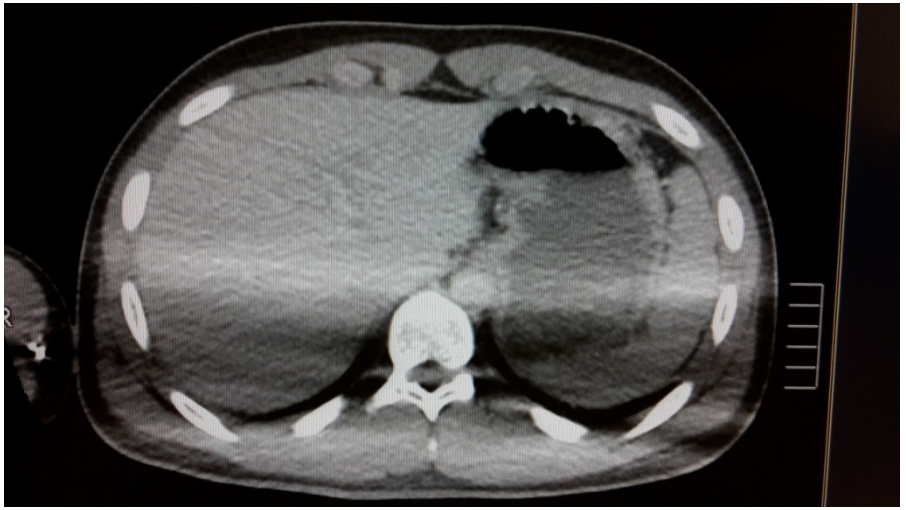
S.th: 5mm
Incr.: 2.5

S.th: 3mm
Incr.: 1,5

Change diameter:

- raise the vertical diameter
- reduce the horizontal diameter



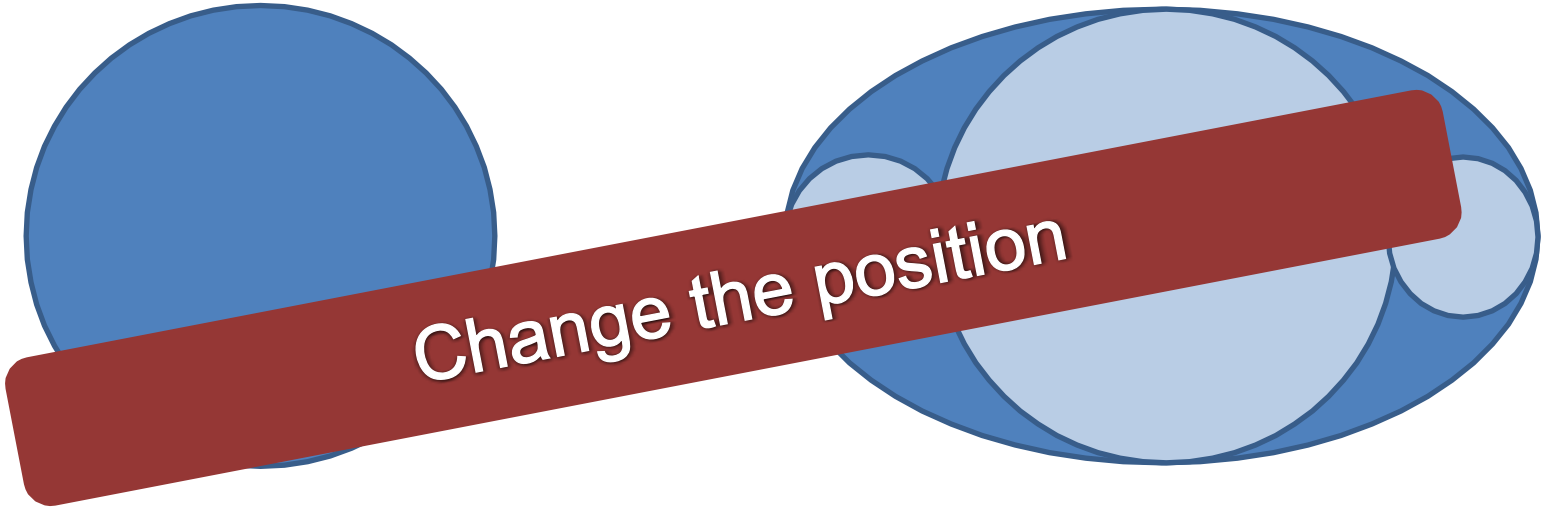


avoid air between body and arms

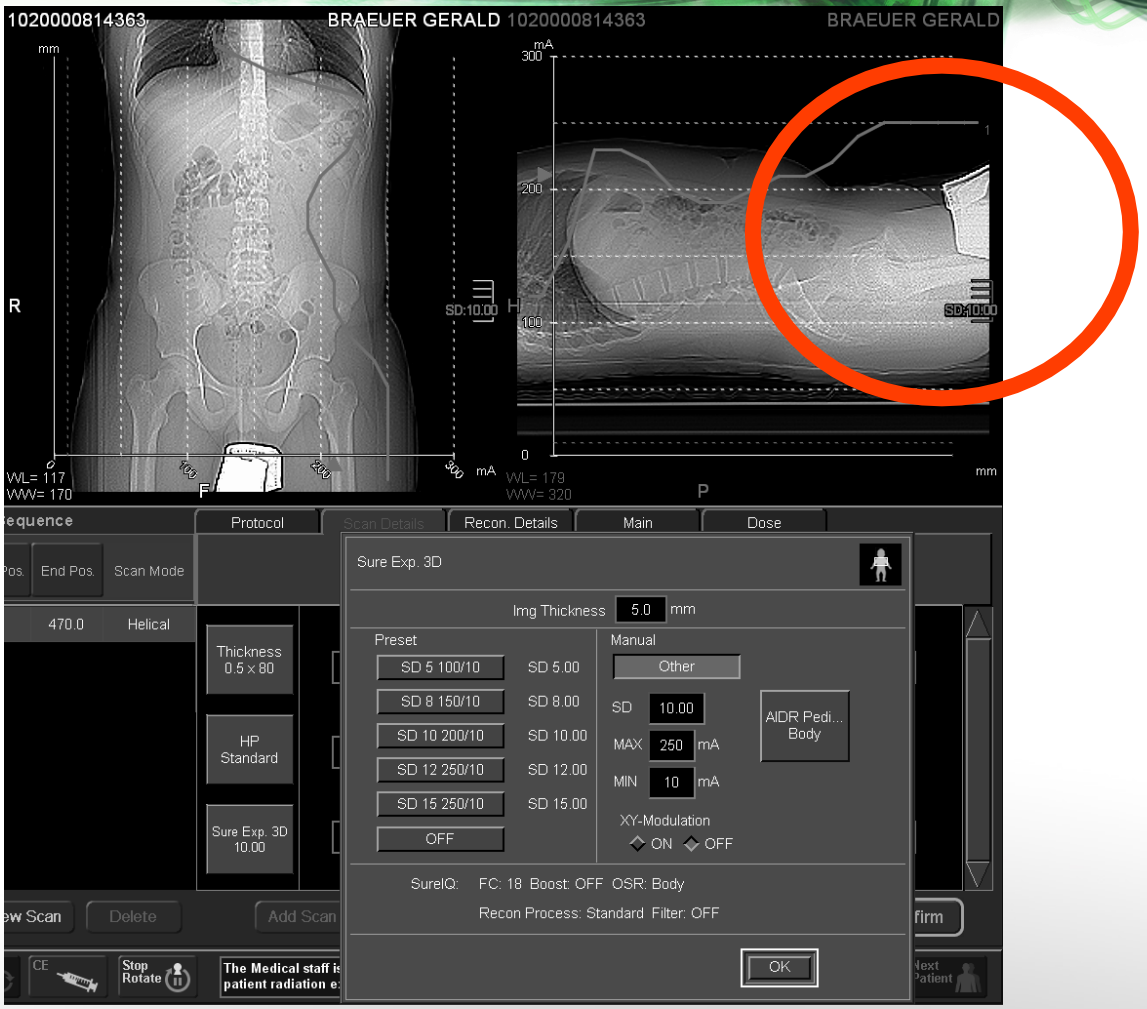
diameter

Perfect dose distribution

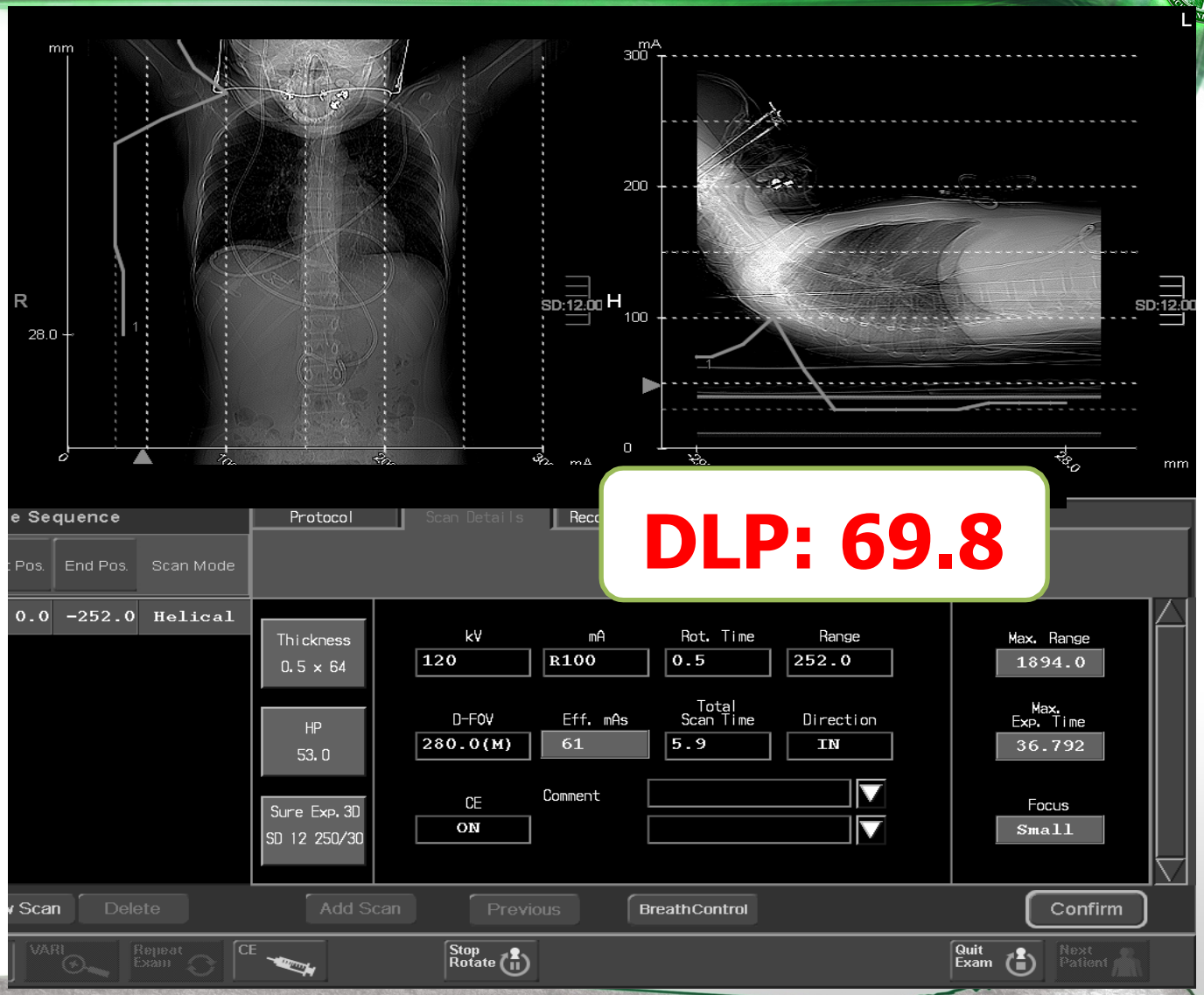
Bad dose distribution



Radiation protection with lead



pitfalls


mm
R
28.0
mA
300
200
100
0
H
SD:12.00
SD:12.00
mm
DLP: 69.8
e Sequence
Protocol
Scan Details
Pos.
End Pos.
Scan Mode
0.0
-252.0
Helical
Thickness
0.5 x 64
HP
53.0
Sure Exp.3D
SD 12 250/30
kV
120
mA
R100
Rot. Time
0.5
Range
252.0
D-FOV
280.0(M)
Eff. mAs
61
Total
Scan Time
5.9
Direction
IN
CE
ON
Comment
Max. Range
1894.0
Max.
Exp. Time
36.792
Focus
Small
Scan
Delete
Add Scan
Previous
BreathControl
Confirm
VARI
Repeat
Exam
CE
Stop
Rotate
Quit
Exam
Next
Patient

nephrolitiasis

trauma

appendicitis

Computed tomography			
Exam	Age or weight group	EDRL	
		$CTDI_{vol}$, mGy	DLP, mGy cm
Abdomen	<5 kg		45
	5-<15 kg	3,5	120
	15-<30 kg	5,4	150
	30-<50 kg	7,3	210
	50-<80 kg	13	480

Table 10.2b. European DRLs for computed tomography. EDRLs for head CT refer to 16 cm phantom and EDRLs for thorax and abdomen for 32 cm phantom. DRLs refer to a complete routine CT examination (one scan series).

nephrolitiasis

trauma

appendicitis

Austrian DRL

Tabelle 8: Diagnostische Referenzwerte für CT-Untersuchungen am Kind

Untersuchungsregion	Gewichts- bzw. Altersklasse	$CTDI_{vol}$[10] [mGy]	DLP[10] [mGy·cm]
Hirnschädel[12]	Säugling (3 bis < 12 Monate)	30	300
	Kleinkind (1 bis < 5 Jahre)	35	450
	Grundschulkind (5 bis < 10 Jahre)	50	650
	Jugendlicher (10 bis < 15 Jahre)	55	800
Thorax	Neugeborenes (3 bis < 5 kg; 0 bis < 3 Monate)	1,0	15
	Säugling (5 bis < 10 kg; 3 bis < 12 Monate)	1,7	25
	Kleinkind (10 bis < 19 kg; 1 bis < 5 Jahre)	2,6	55
	Grundschulkind (19 bis < 32 kg; 5 bis < 10 Jahre)	4,0	110
	Jugendlicher (32 bis < 56 kg; 10 bis < 15 Jahre)[13]	6,5	200
Abdomen	Grundschulkind (19 bis < 32 kg; 5 bis < 10 Jahre)	5,0	185
	Jugendlicher (32 bis < 56 kg; 10 bis < 15 Jahre)	7,0	310

[12] Die angegebenen $CTDI_{vol}$- und DLP-Werte für Untersuchungen am Hirnschädel beziehen sich auf den 16 cm-CTDI-Prüfkörper („Kopfphantom"). Die anderen Untersuchungen auf den 32 cm-Prüfkörper („Körperphantom").

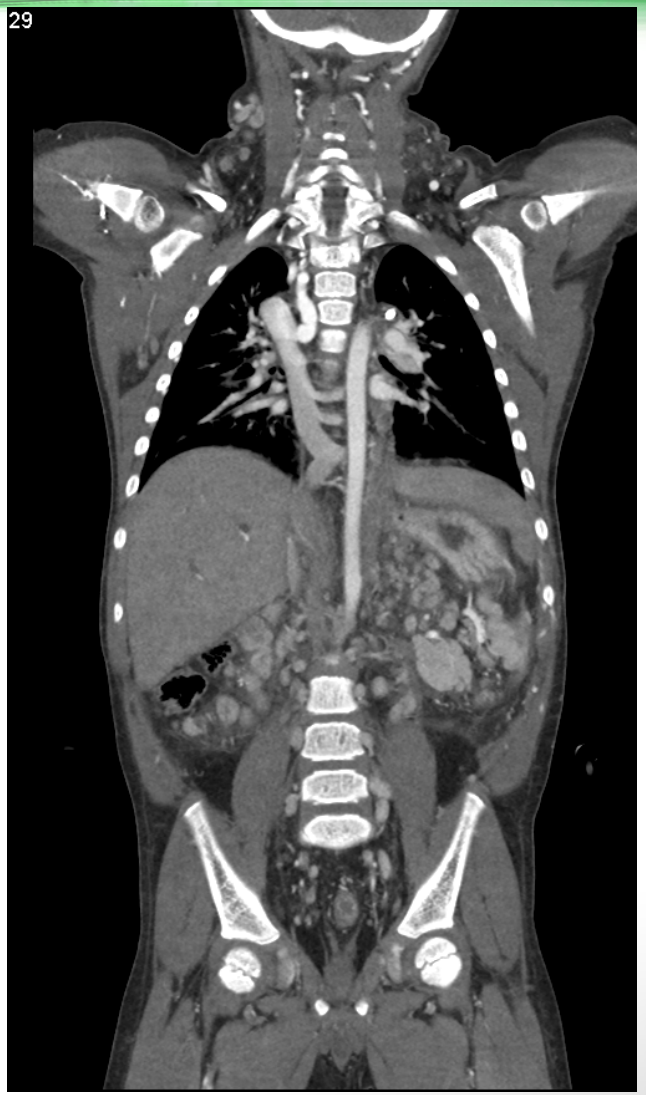
[13] Bei Kindern/Jugendlichen dieser Altersgruppe können je nach Wachstumsschub die Thoraxlängen (Körpergrößen) sehr stark variieren, so dass in Einzelfällen auch bei eingehaltenen $CTDI_{vol}$-Wert der DLP-Wert überschritten sein kann.

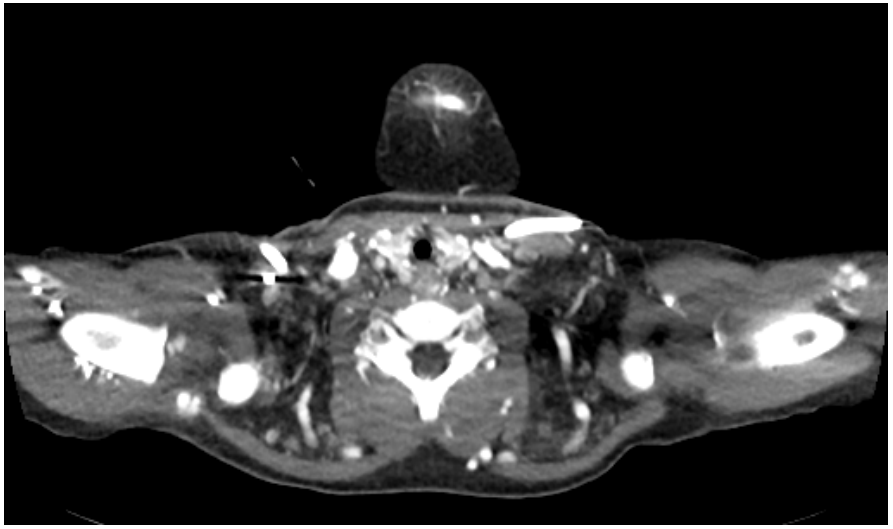
Quelle: Bundesamt für Strahlenschutz
Bekanntmachung der aktualisierten diagnostischen Referenzwerte für diagnostische und interventionelle Röntgenanwendungen
Vom 22. Juni 2016

use your creativity

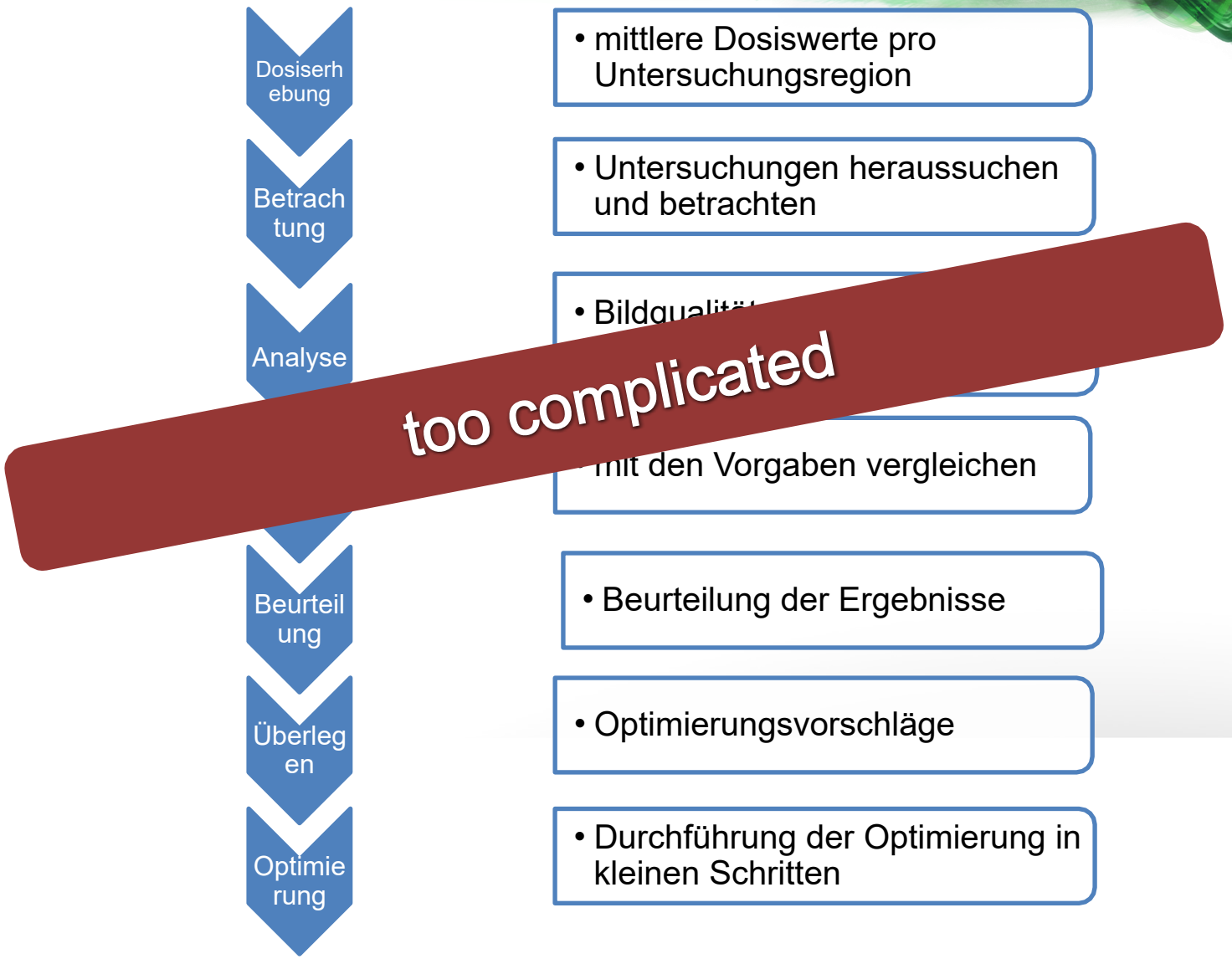
- CTA and CT Phlebographie „One Run“
  - ✓ f.e. for preparation for a transplantion

use your creativity





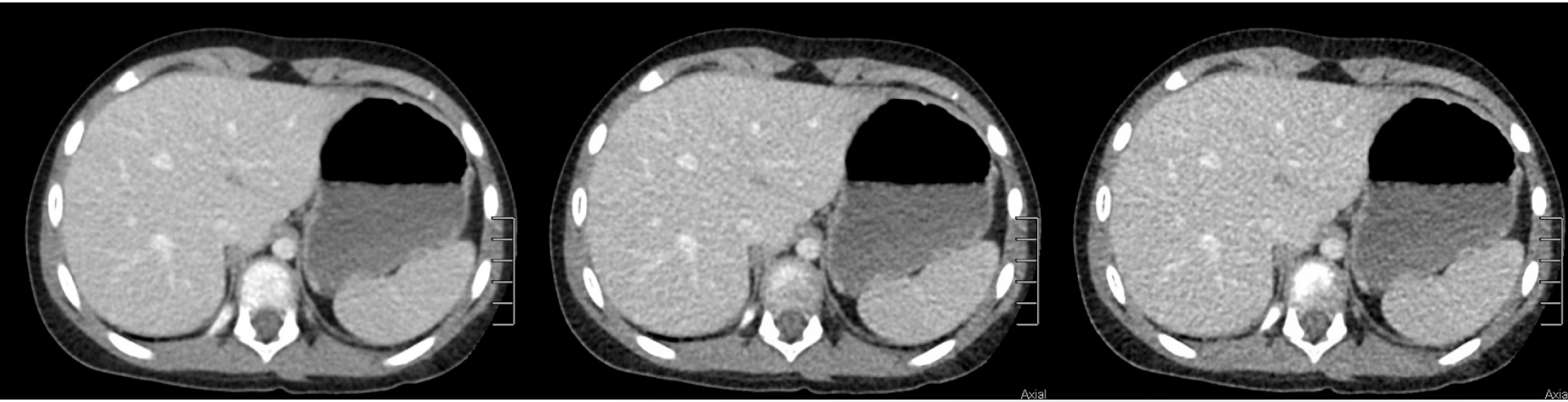
from optimization potential to optimization strategy



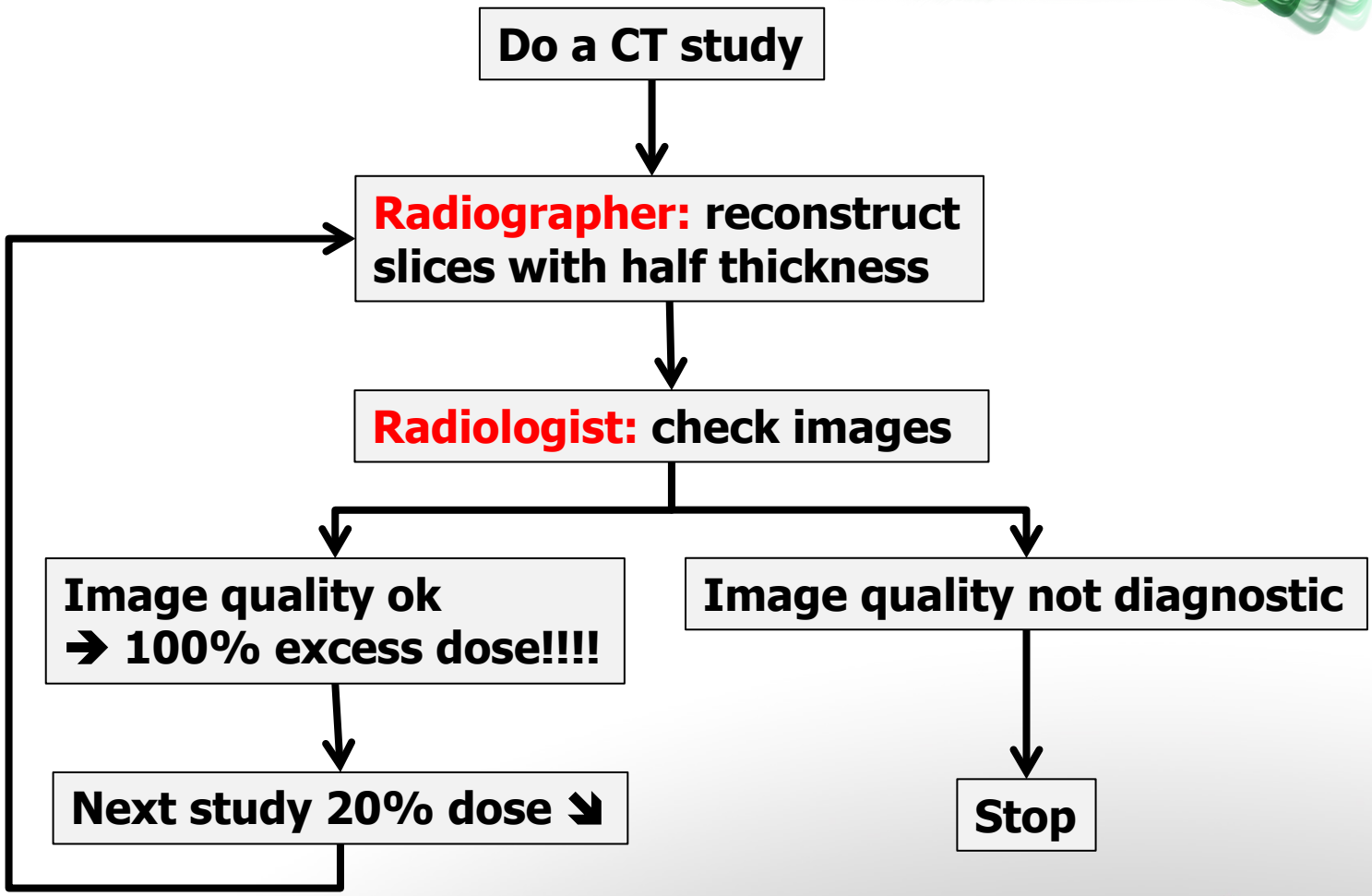
optimization algorithm à la Graz

Sorantin‘scher „Half Slice Thickness Approach“:

- Do a study
- Let the radiographer recalculate study with halve slice thickness (noise must increase)
- image quality is still good → next study 20% dose increase

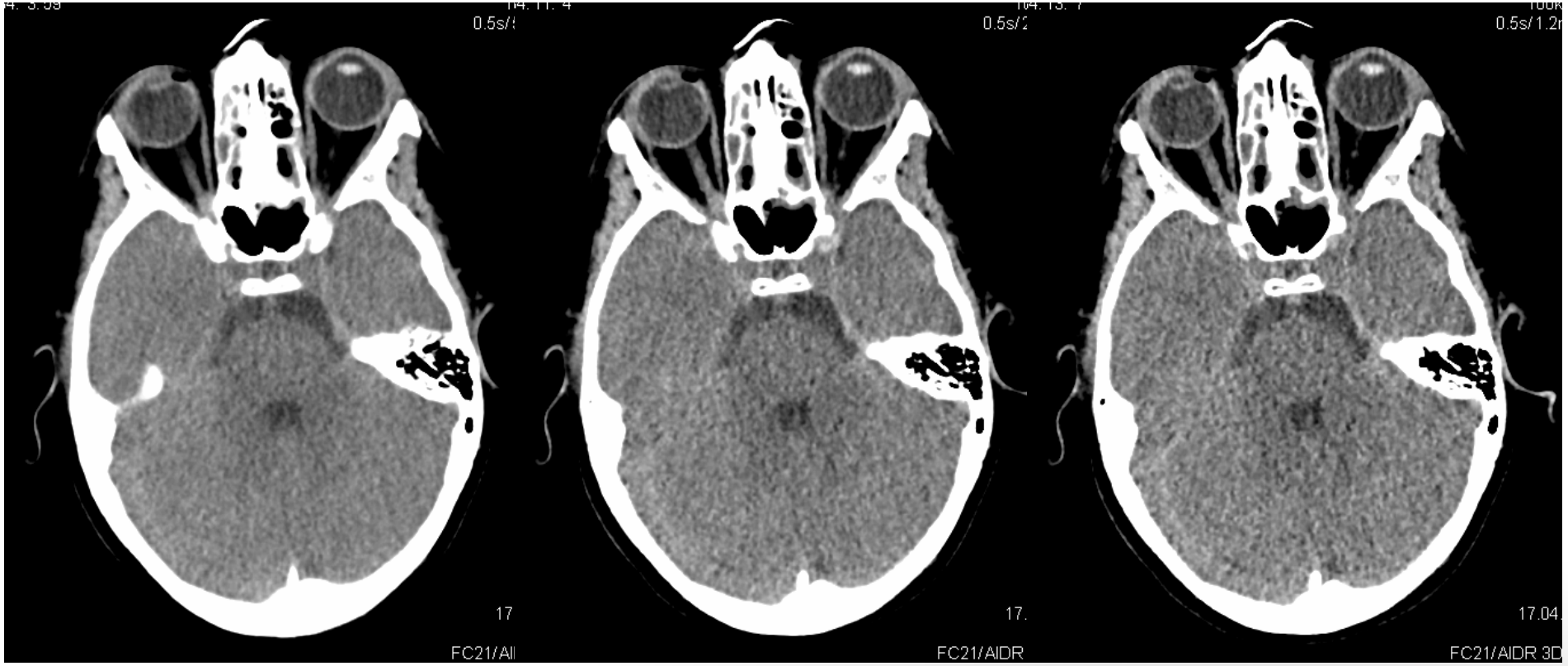


workflow

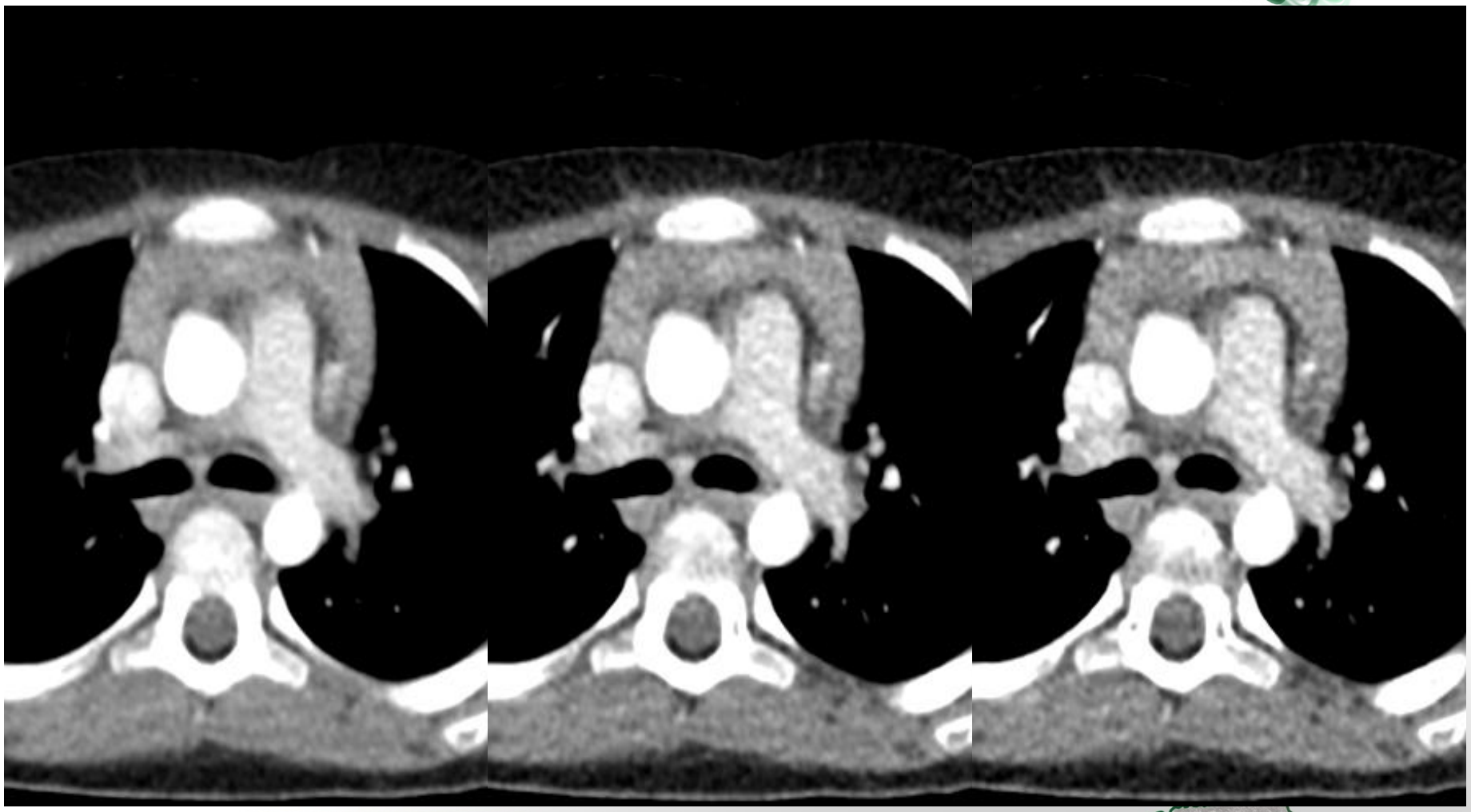

Do a CT study
Radiographer: reconstruct slices with half thickness
Radiologist: check images
Image quality ok
➔ 100% excess dose!!!!
Next study 20% dose ↘
Image quality not diagnostic
Stop

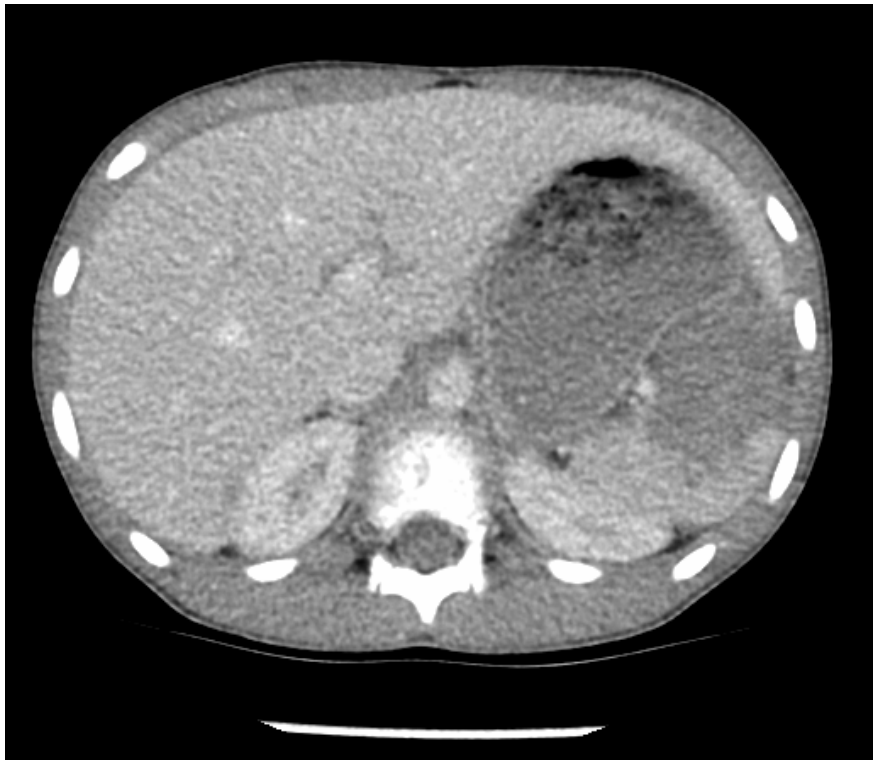
Sorantin‘scher „Half Slice Thickness Approach“

HSTA – Examples...



HSTA – Examples...





recalculate study with halve slice thickness

Take home

- Scan length
- Position patient carefully
- Have protocols – tailored to clinical question and body size and body composition
- CTDIvol, DLP, kV, mAs
- Check diagnostic reference levels (DRL‘s)
- CAVE: influence of AEC and radiation protection devices
- Use Sorantin‘s „Halve slice thickness approach“
- AND...

MED UNI GRAZ

Simply speaking…

You have to love your machine …

Thank you for your attention!
Now you have austrian superpower!