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SIEMENS

Mallinckrodt Pharmaceuticals

UNIVERSITEIT TWENTE.

Reduction of contrast medium volume and radiation dose in CT angiography

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Kick-off Innovation 4M
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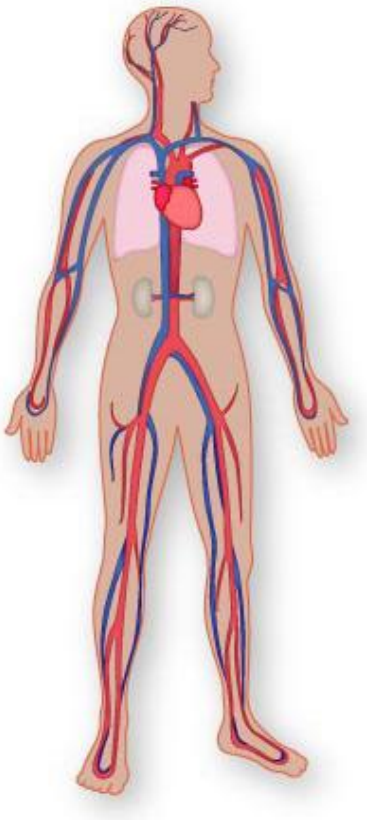
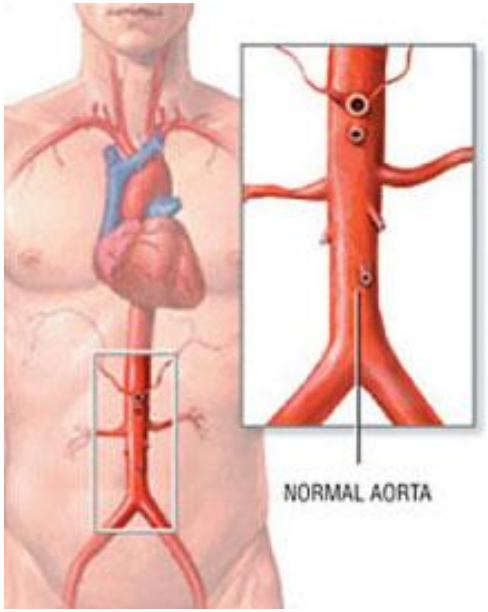
CT Angiography





Diseases:

- Aneurysm / rupture
- Dissection
- Stenosis and thrombosis
- Inflammation

CT Angiography

Intravascular administration of iodinated contrast media

:rast per

58.000 times necessary amount

per day:

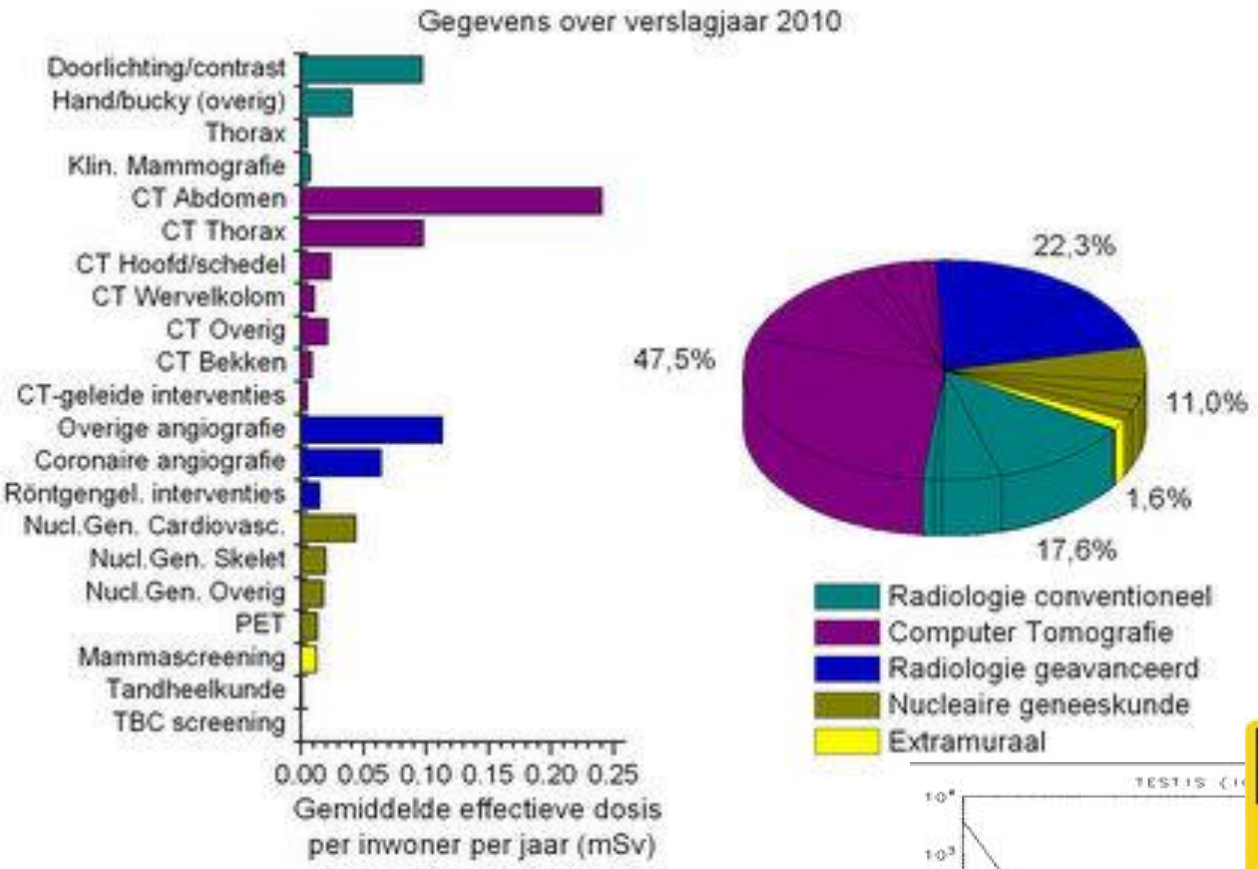
Contrast-induced nephropathy (CIN)
Epidemiology

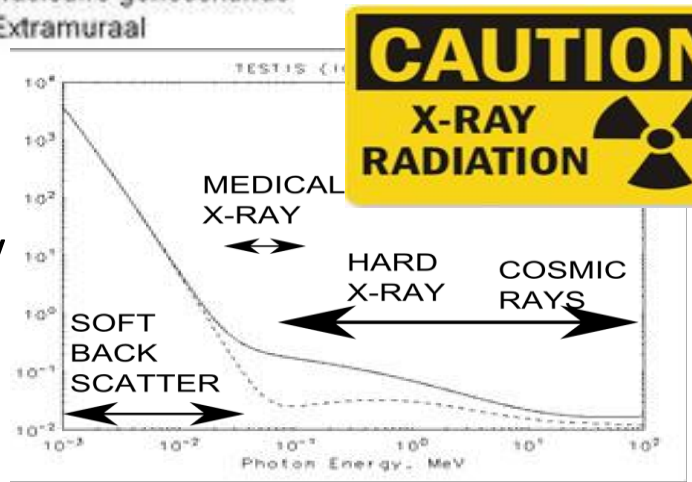
• CIN incidence	2 – 31%
• Diagnostic procedure	1.6 – 2.4%
• No risk factors	2%
• Diabetes	9%
• Diabetes & CKD	50 – 90%
• > 60 years	8 – 16%

Patients with multiple risk factors:

Incidence > 50% CIN (>1% risk dialysis)

Radiation dose

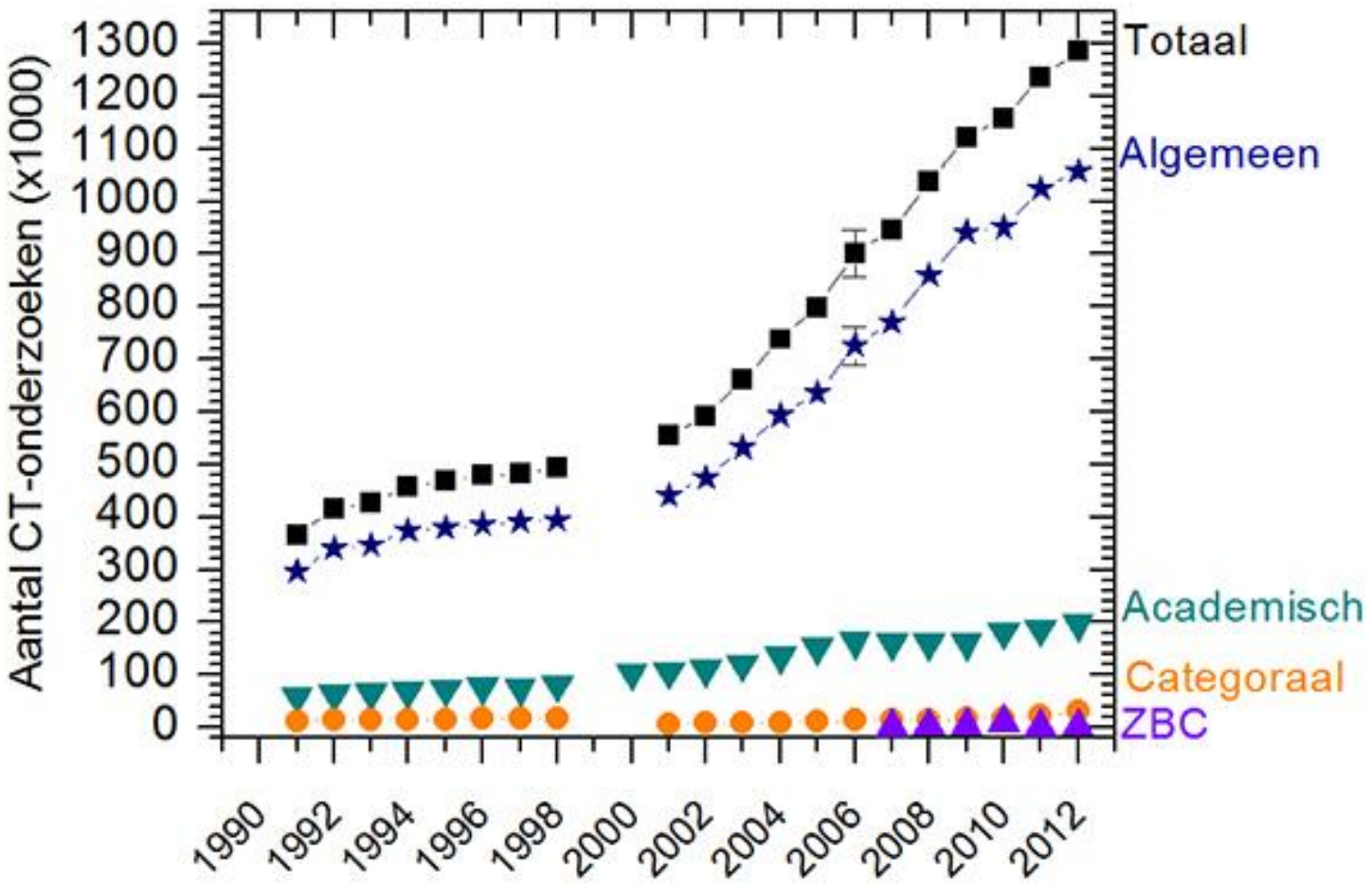




High radiation dose for patient: 1 – 19 mSv

- Majority of CTA scans: 120 kV

Trend CT scans



1,3 miljoen CT-onderzoeken / jr in NL, 0,5 miljoen met contrastmiddel

CTA studies JBZ

Reduction of contrast medium volume and radiation dose in CT angiography

Purpose studies JBZ

- Reduce the amount of contrast medium
- Reduce the radiation dose
- Patient tailored CTA protocol

Started 2011 in cooperation with:

- University of Twente
- Siemens
- Mallinckrodt

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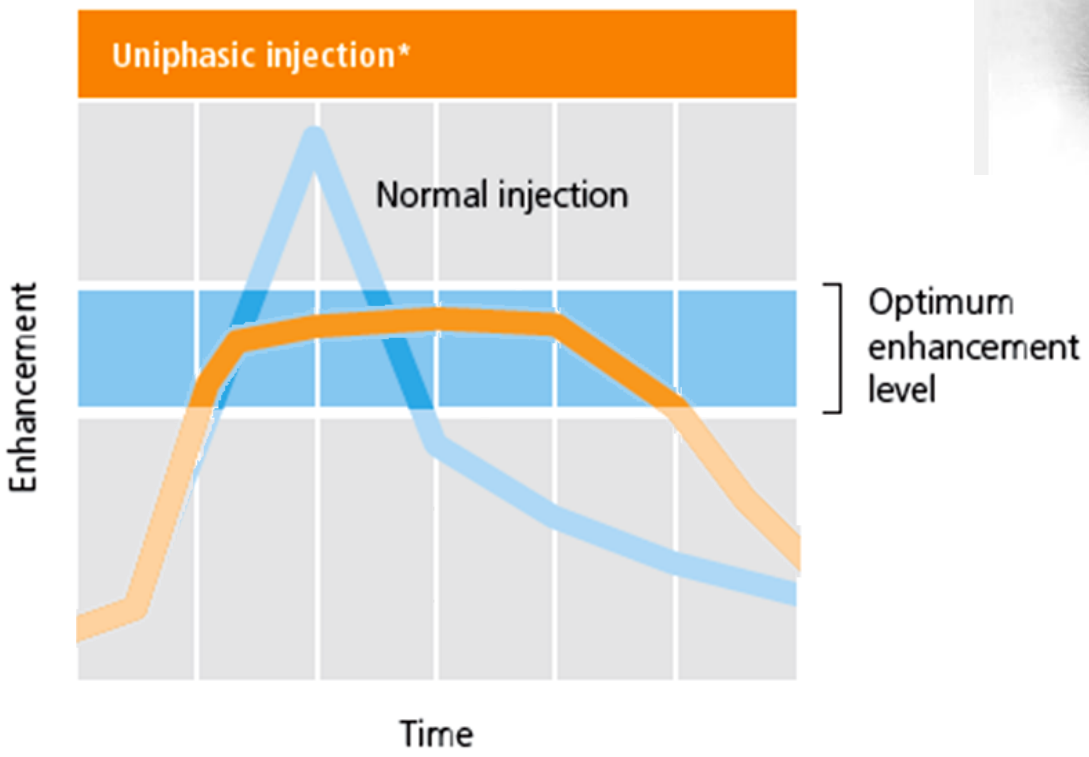
CTA studies JBZ

SIEMENS

Mallinckrodt
Pharmaceuticals

CTA studies JBZ



CTA studies JBZ

	CTA 1	CTA 2	CTA 3	CTA 4
Contrast volume	100 mL vs. 89 mL	89 mL vs. 50 mL	30 mL	38 mL – 19 mL
Kilo voltage	120 kV	120 kV	120, 100, 80 kV	100 and 80 kV
Reduction in contrast volume tov 100 mL	11%	50%	70%	60 – 75%
Reduction in radiation dose tov 120 kV	–	–	25 – 60%	30 – 65%

CTA with 100 mL

CTA with 50 mL

CTA with
20 mL of contrast medium

140 kV

120 kV

80 kV

	140 kV	120 kV	80 kV
Qualitative score	3.5	4.5	5

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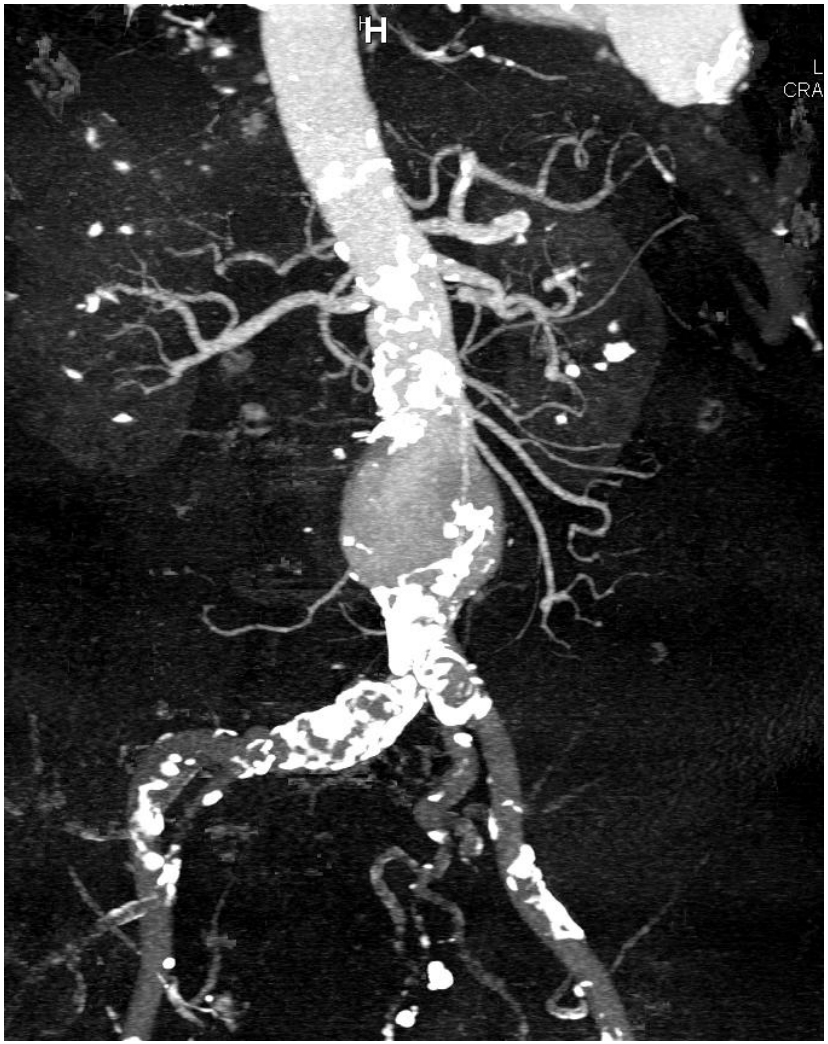
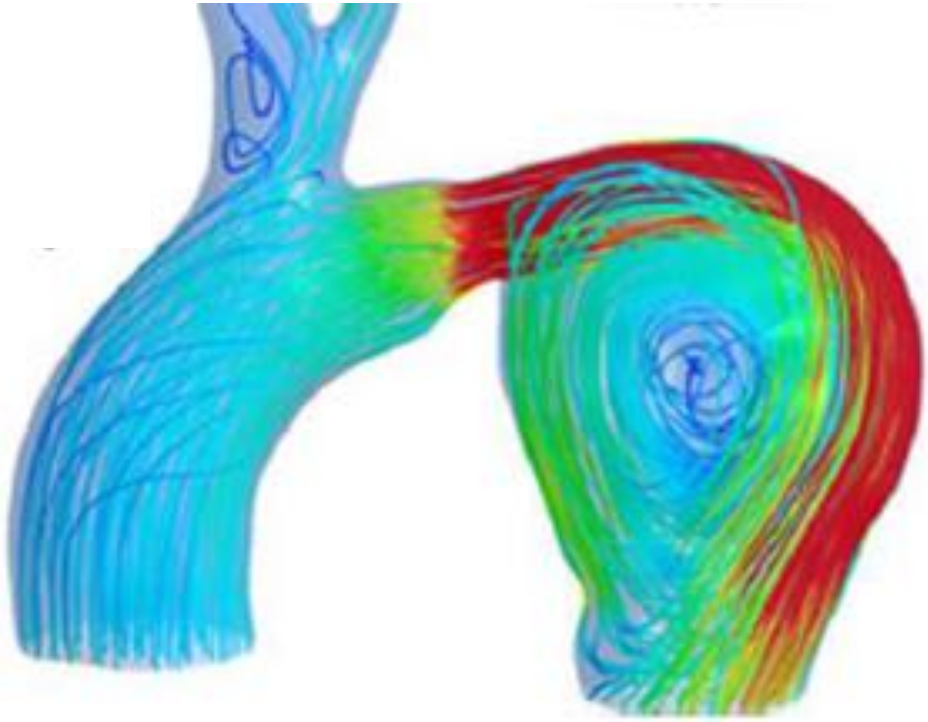
Patient tailored CTA protocol

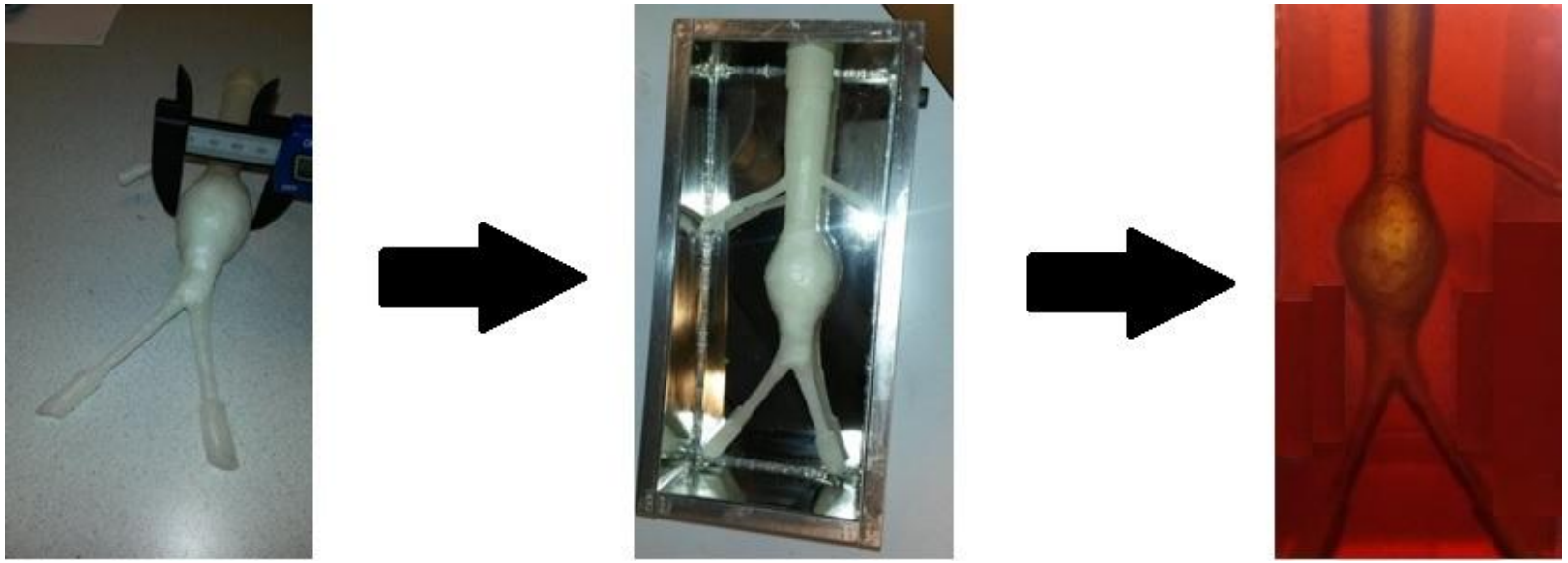
	A	B	C	D
1	**MAN**			
2	**Berekening hoeveelheid contrast op basis van 'Lean body mass'**			
3				
4	**Gewicht (kg)**	75		
5	**Lengte (m)**	1,75		
6	**BMI**	24,5		
7	**LBM**	54,4		
8				
9			**BMI < 28**	**BMI ≥ 28**
10	**Hoeveelheid contrast (mL)**		21,8	32,7
11				
12			80 kV	100 kV
13	**Scan delay**		TP + 8 sec	TP + 10 sec
14	TP = time to peak enhancement			
15				

Circulating phantom study





Circulating phantom study



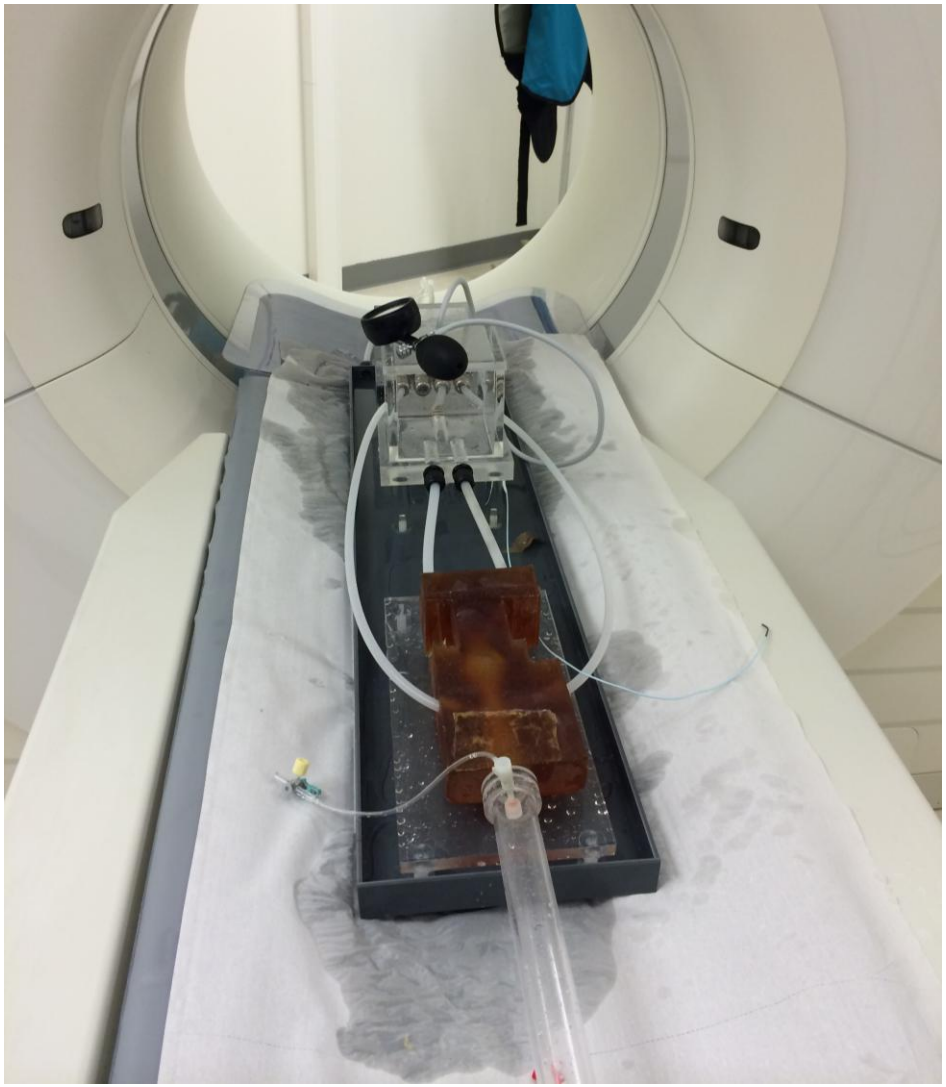
Circulating phantom study

Materials

- Circulating phantom
- Aortoiliac models with increasing AAA sizes

Analysis

- *CTA*
- *DSA*
- *Ultrasound*



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Circulating phantom study

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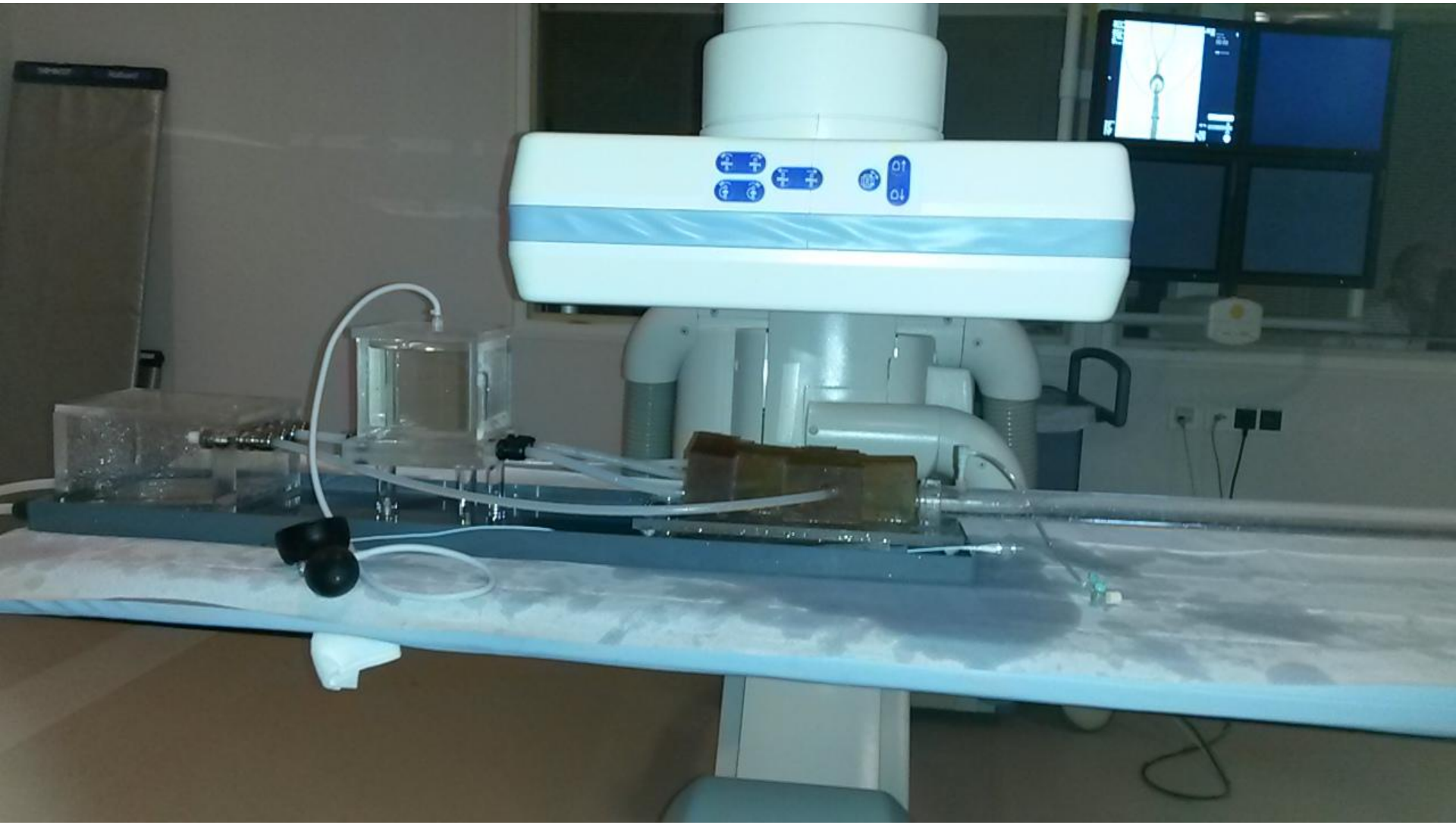
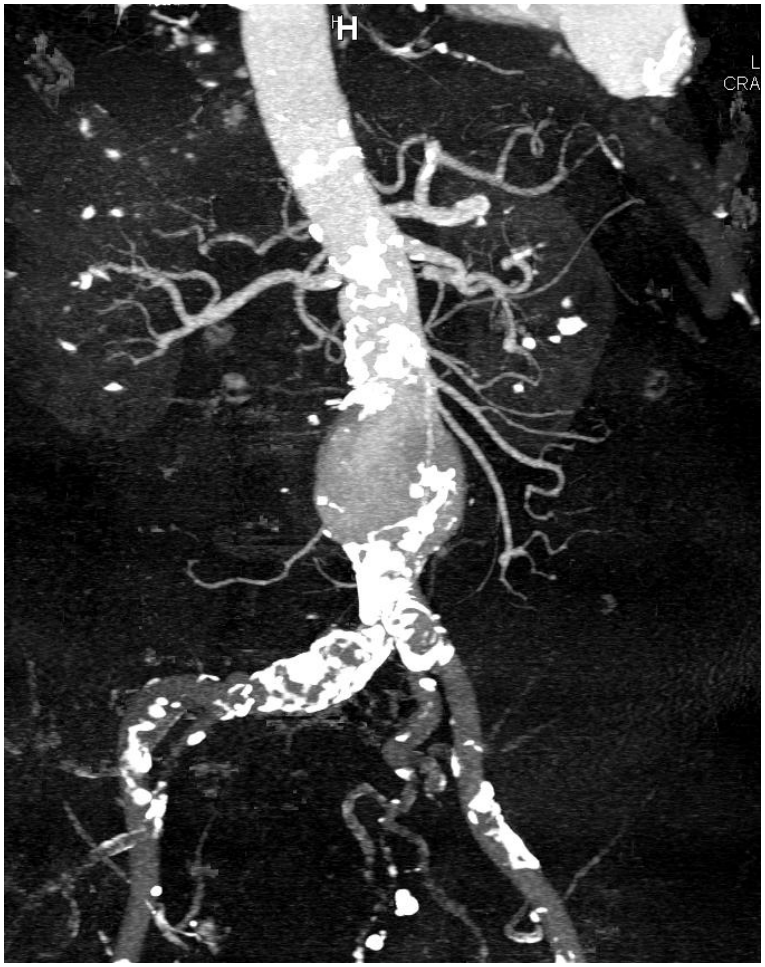
Circulating phantom study

DSA



Circulating phantom study

AAA Ø 7 cm



CT studies JBZ – Conclusion

Normal kV 120 kV	Low kV 80 kV

Contrast enhancement

Increased iodine absorption

Contrast medium volume

Patient (CIN) & financial benefits

Image noise

Radiation dose

Reduction of CT-induced cancer

Future CTA studies

- Patient tailored injection speed to cardiac output of patients with Dual-head injector (Mallinckrodt)
- Further reduce radiation dose and improved image noise in low dose CTA with ADMIRE (Siemens)
- Extend CTA protocols to all CT protocols with iodinated contrast medium (MC)

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Dank voor uw aandacht