

Nuklearmedizin in der Diagnose von Erkrankungen der Niere

⇒ globale Funktion

(Transportstörung prä / intra / postrenal)

⇒ seitengetrennte Funktion

⇒ renovaskulärer Hochdruck

⇒ erweitertes NBKS

⇒ Refluxdiagnostik

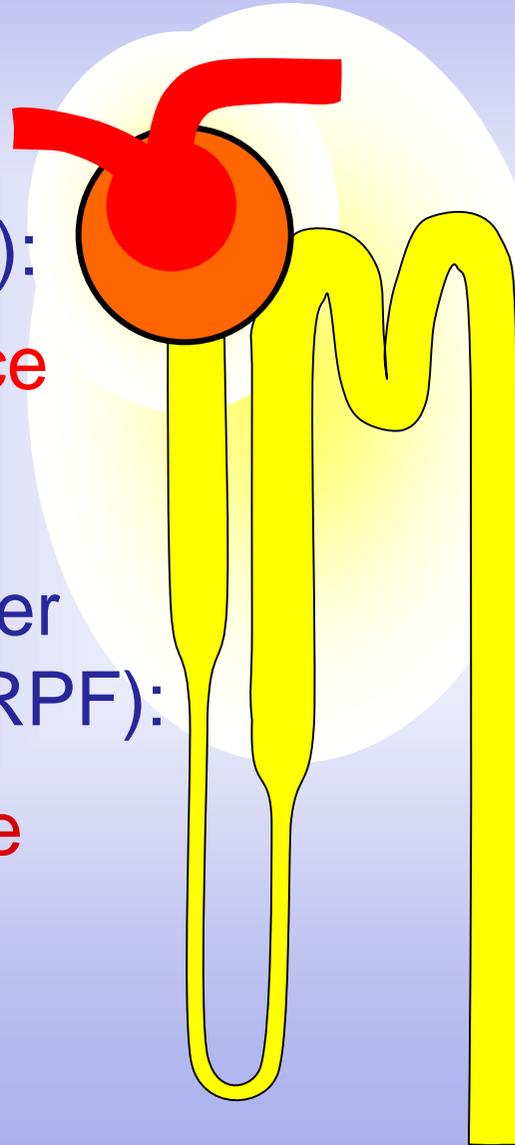
Renale Partialfunktionen

glomeruläre
Filtration (GFR):

Inulin-Clearance

effektiver renaler
Plasmafluß (ERPF):

PAH-Clearance



szintigraphische
Clearancebestimmung

Tc99m-DTPA

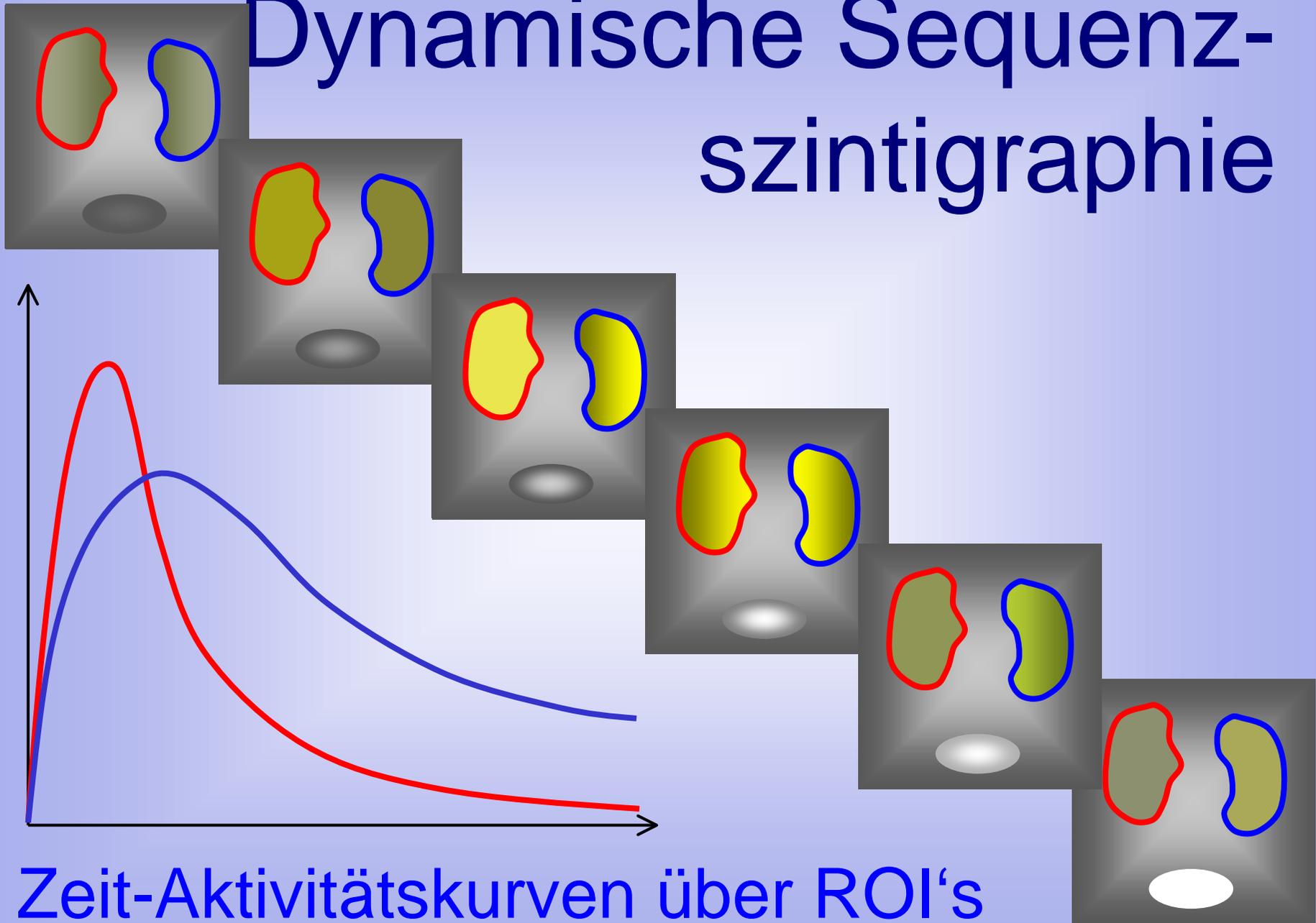
„tubuläre Sekretion“

Tc99m-MAG3

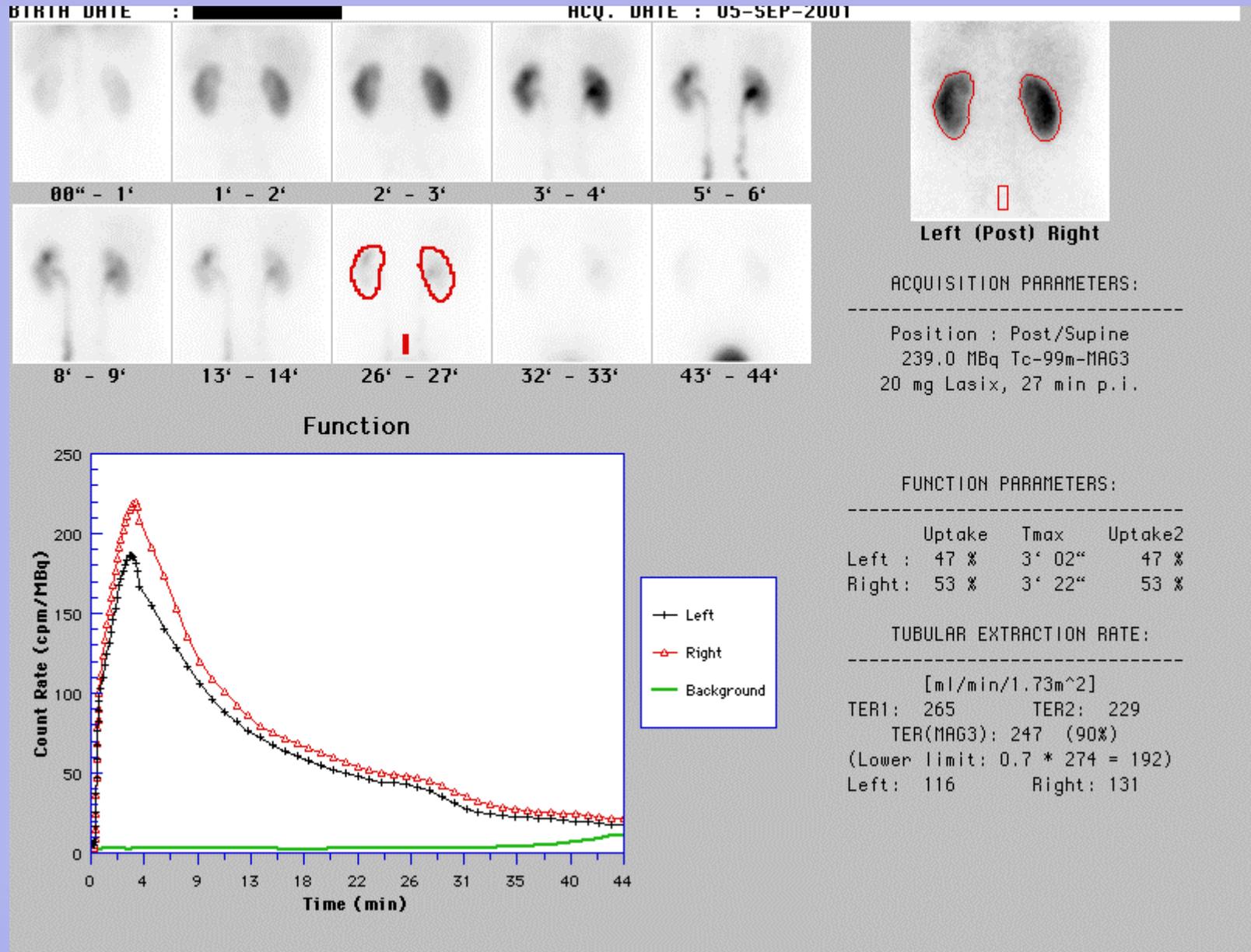
J123-OIH

Ortho-Jod-Hippuran

Dynamische Sequenz- szintigraphie



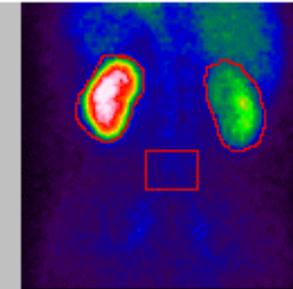
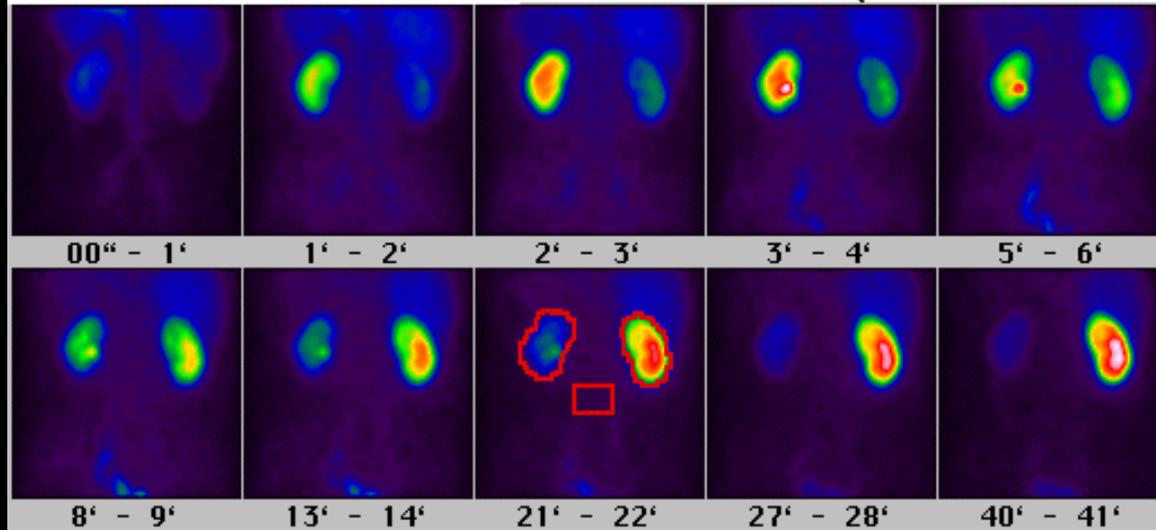
Nieren-Sequenzszintigraphie



Sekretions- und Exkretionsphase

PATIENT ID : R1934.99.2835

ACQ. DATE : 25-MAY-1999



Left (Post) Right

ACQUISITION PARAMETERS:

Position : Post/Supine
 257.0 MBq Tc-99m-MAG3
 20 mg Lasix, 22 min p.i.

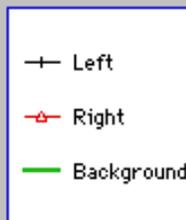
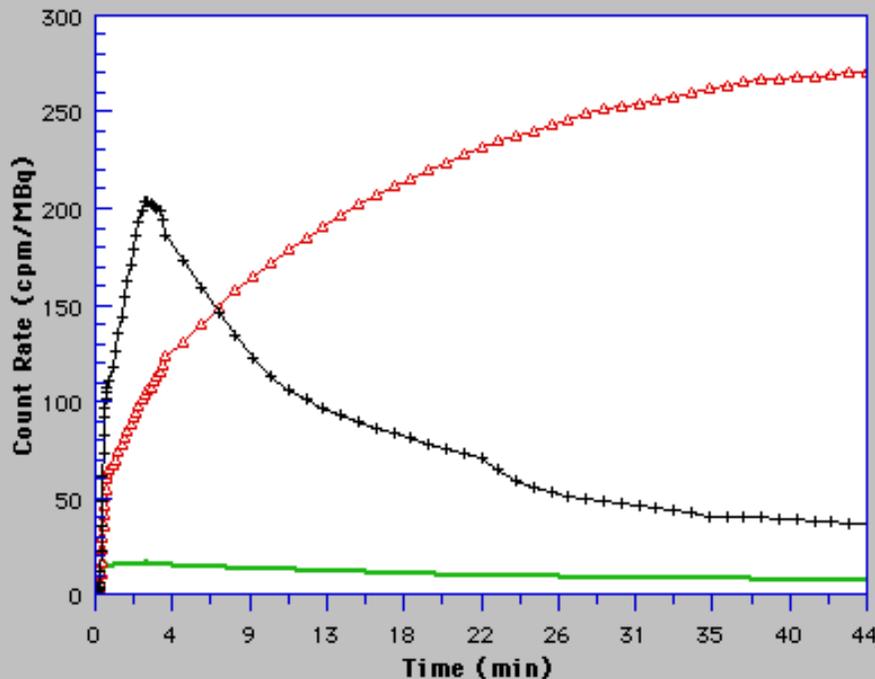
FUNCTION PARAMETERS:

	Uptake	Tmax	Uptake2
Left :	71 %	2' 44"	65 %
Right :	29 %	43' 44"	35 %

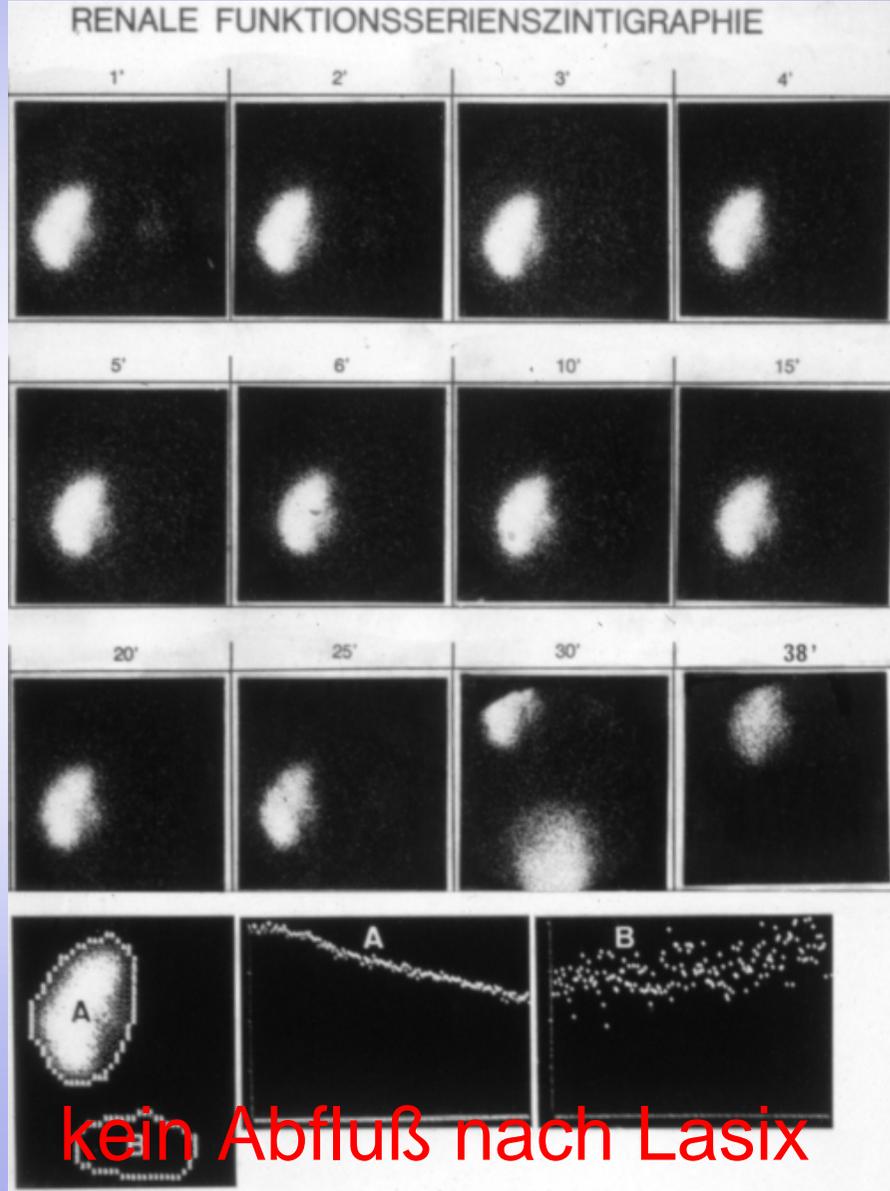
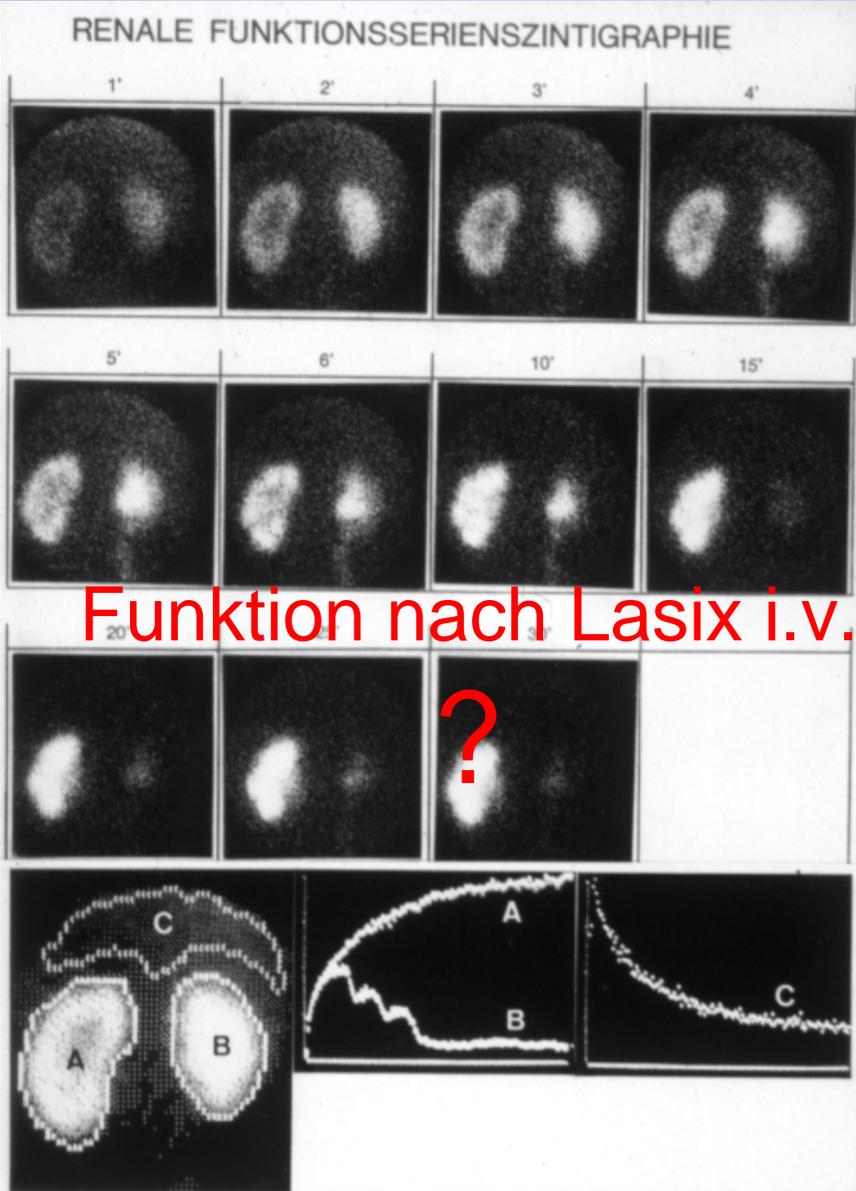
TUBULAR EXTRACTION RATE:

[ml/min/1.73m²]
 TER1: 194 TER2: 206
 TER(MAG3): 200 (80%)
 (Lower limit: 0.7 * 249 = 174)
 Left: 142 Right: 58

Function

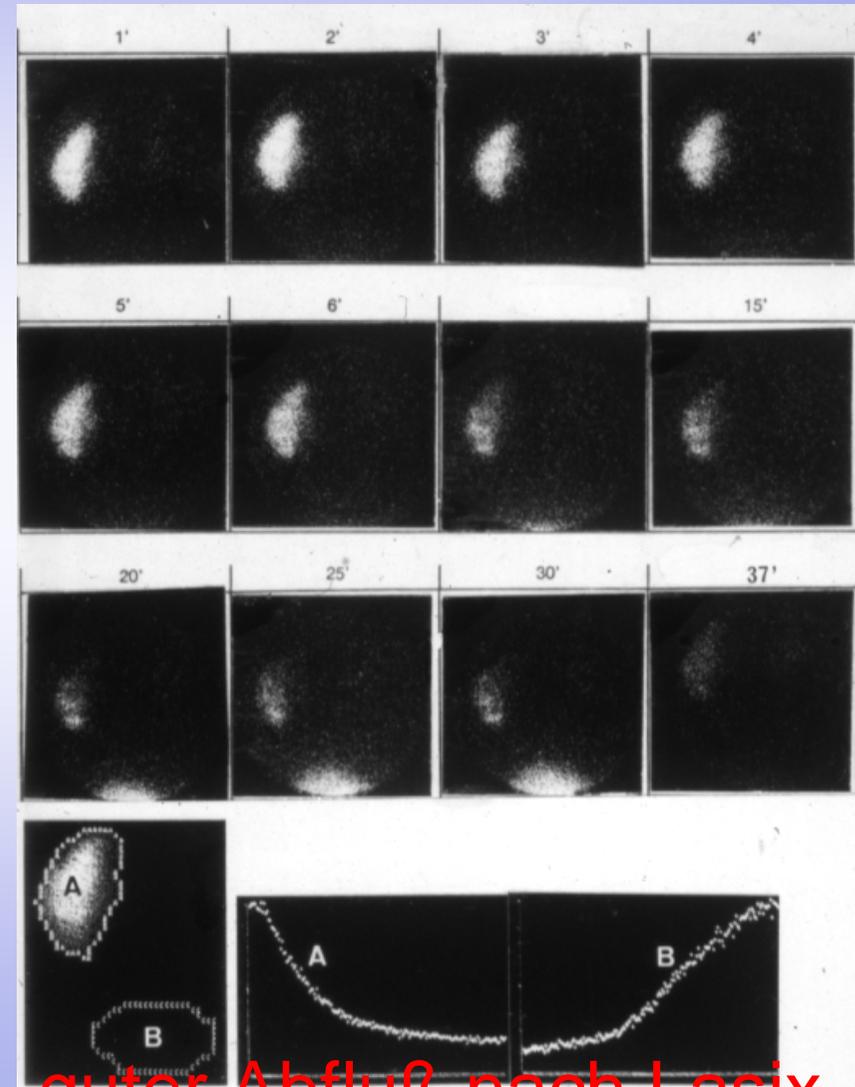


Ureterabgangsstenose links

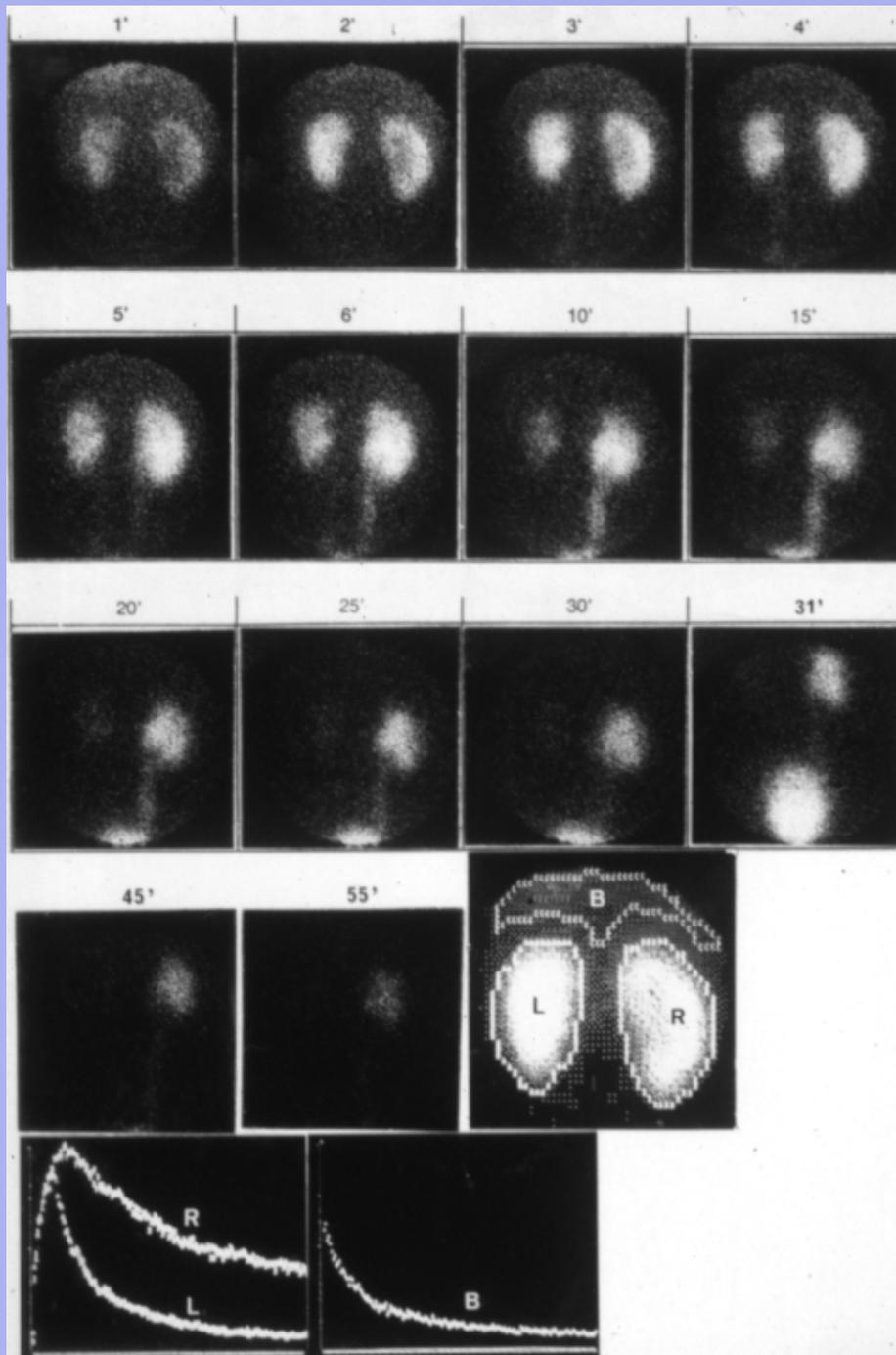


Ureterabgangsstenose links post Op

Nierenbecken erweitert



guter Abfluß nach Lasix



Abflußhindernis vor Uretermündung

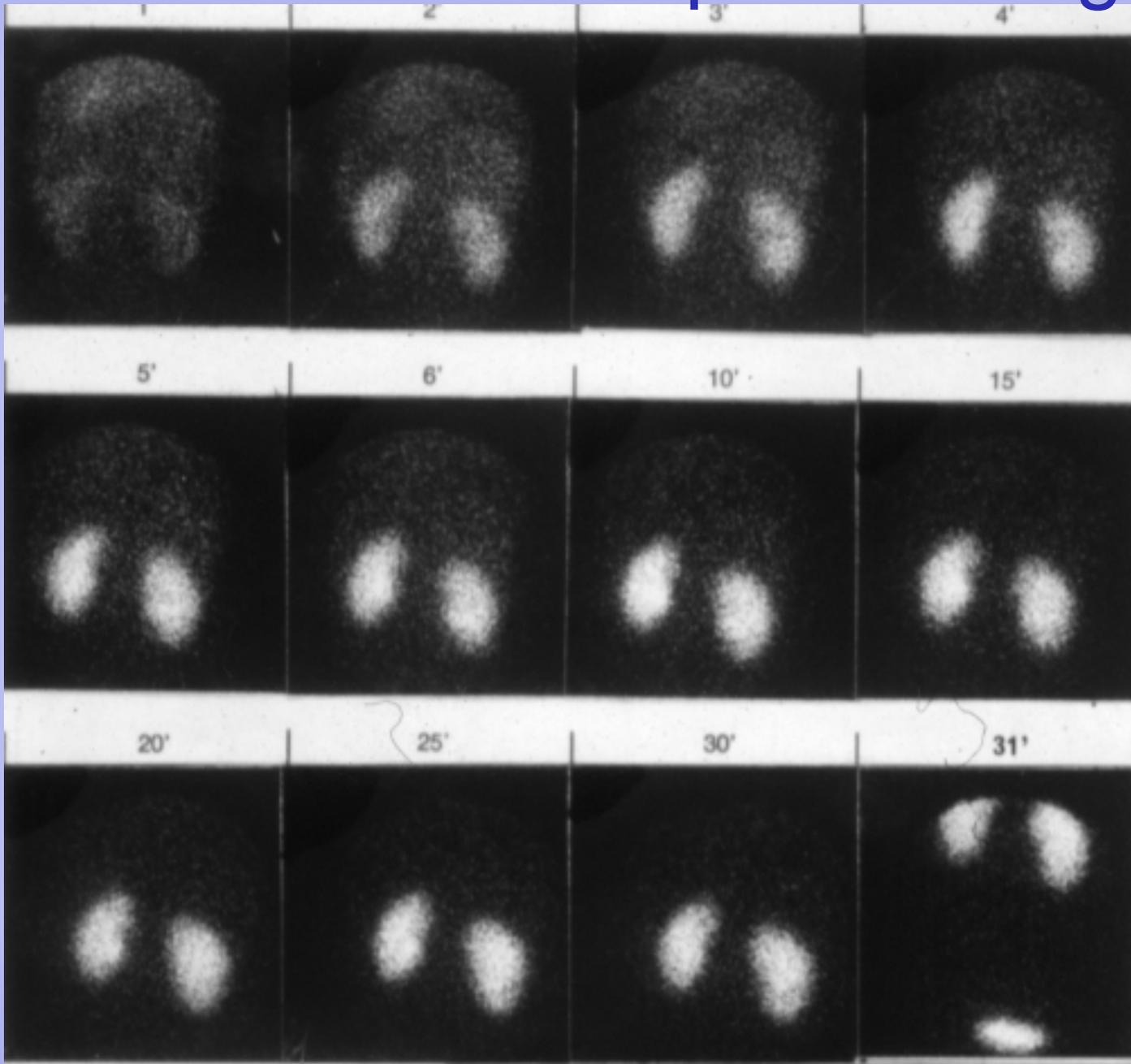
Funktion beider
Nieren (noch) gut

Abfluß rechts gestört
Ureter gestaut

Harnleiterstein in Uretermündung



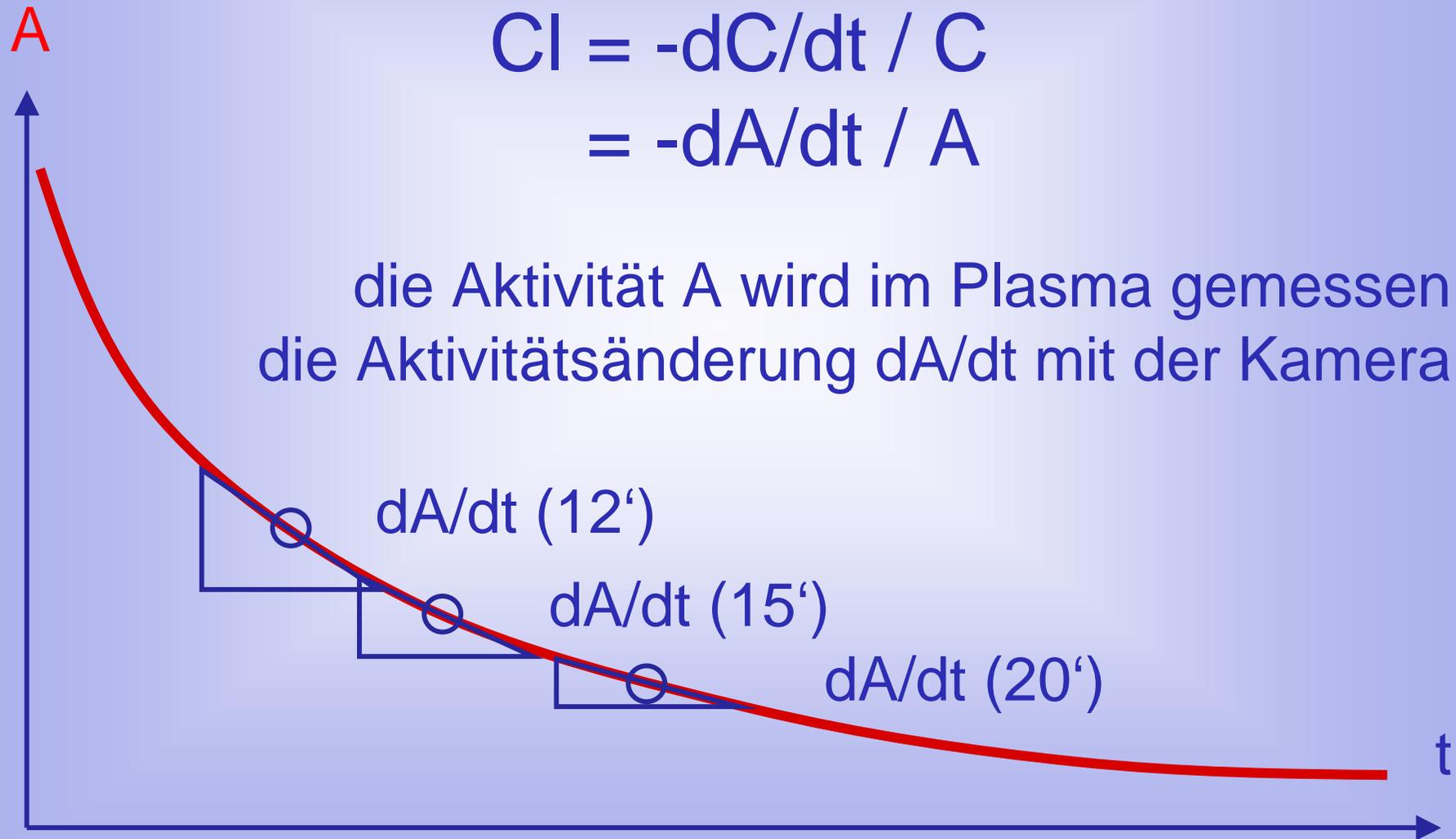
Intrarenale Transportstörung



Bestimmung der globalen Clearance

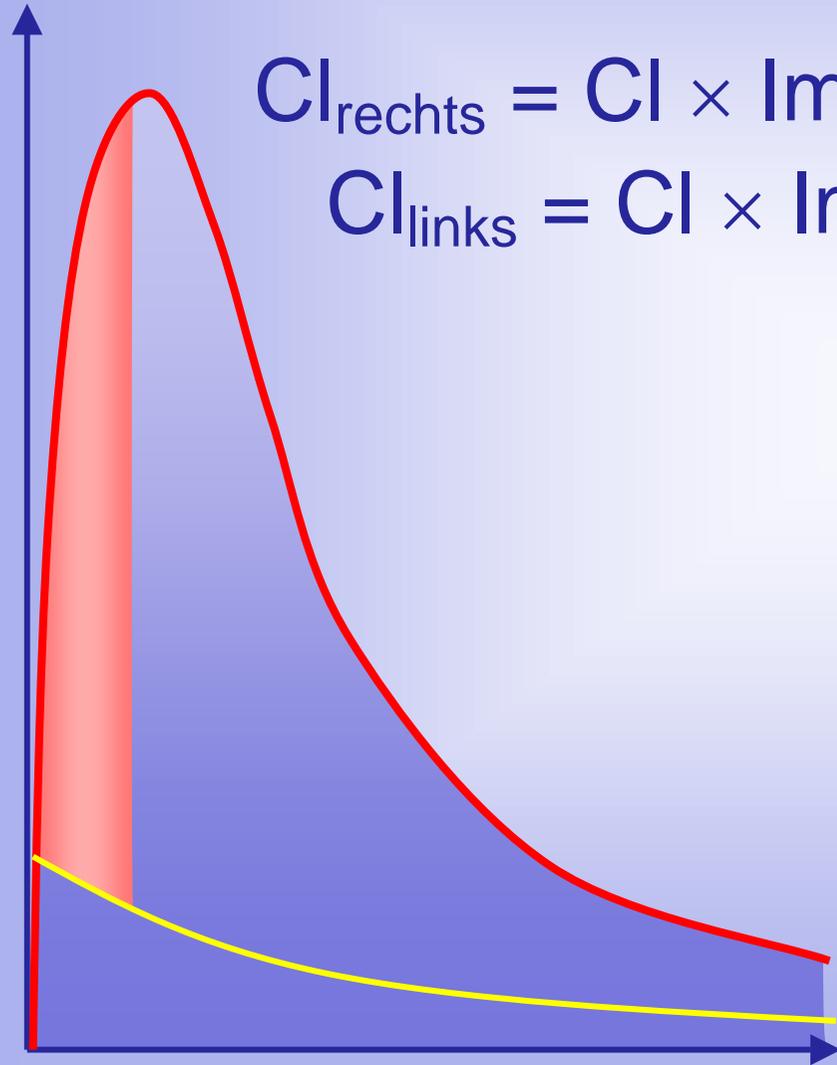
$$Cl = -dC/dt / C$$
$$= -dA/dt / A$$

die Aktivität A wird im Plasma gemessen
die Aktivitätsänderung dA/dt mit der Kamera



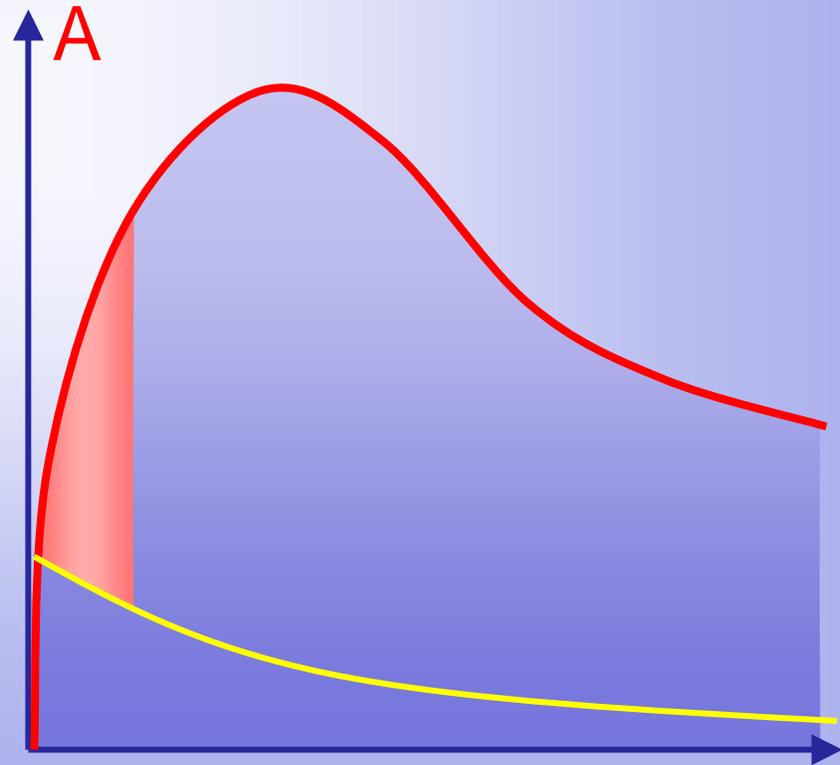
Bestimmung der seitengetrenten Clearance

A

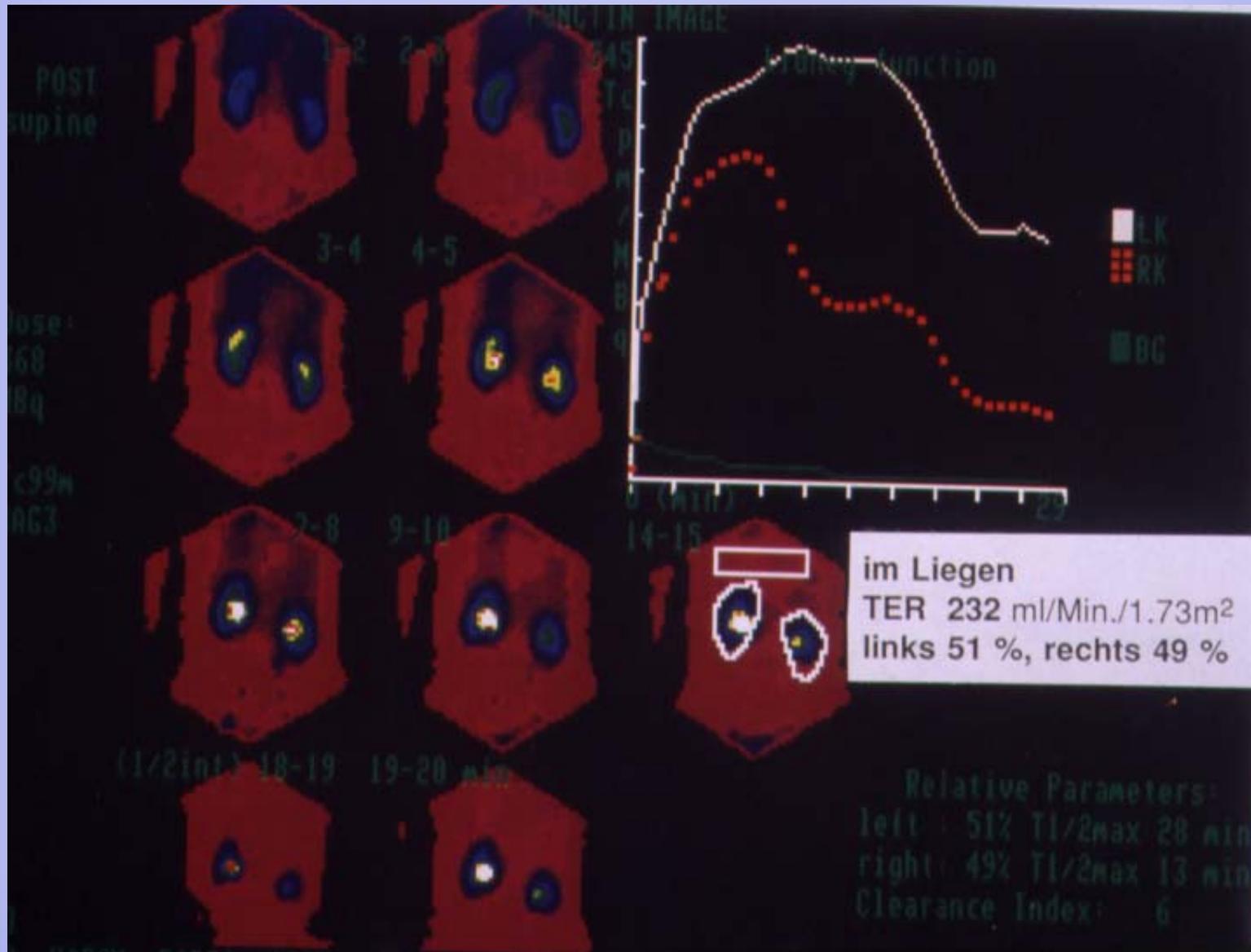


$$Cl_{\text{rechts}} = Cl \times \text{Imp}_{\text{rechts}} / (\text{Imp}_{\text{links}} + \text{Imp}_{\text{rechts}})$$

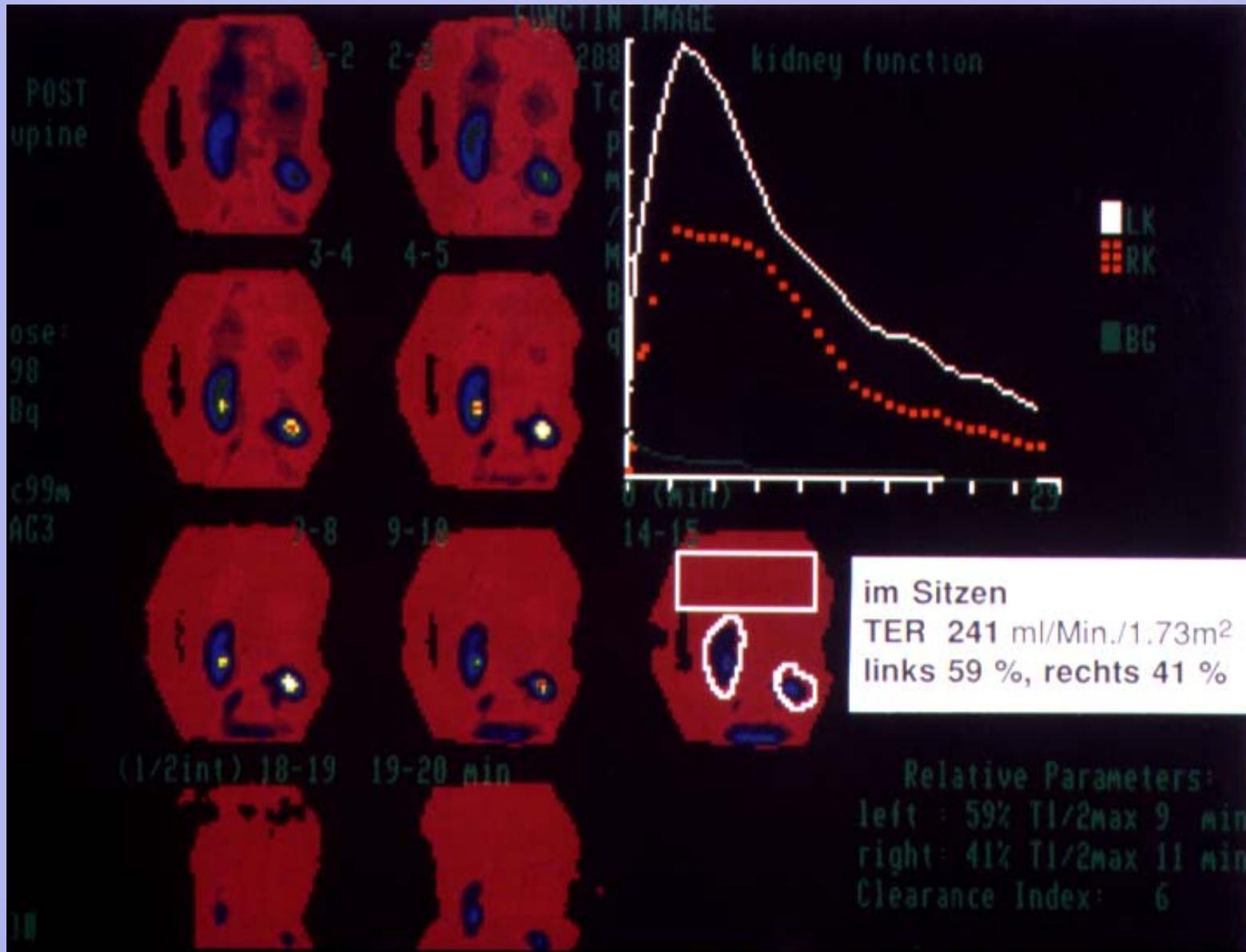
$$Cl_{\text{links}} = Cl \times \text{Imp}_{\text{links}} / (\text{Imp}_{\text{links}} + \text{Imp}_{\text{rechts}})$$



Funktion bei ren mobilis



Funktionsverlust im Sitzen ca. 15%



Nierenfunktionsszintigraphie bei V.a. renovaskuläre Hypertonie

relevante Nierenarterienstenose (NAS)

- ⇒ Clearanceeinschränkung (gering)
- ⇒ Phasenverschiebung (deutlicher)

Captopriltest bei unklarem Befund:

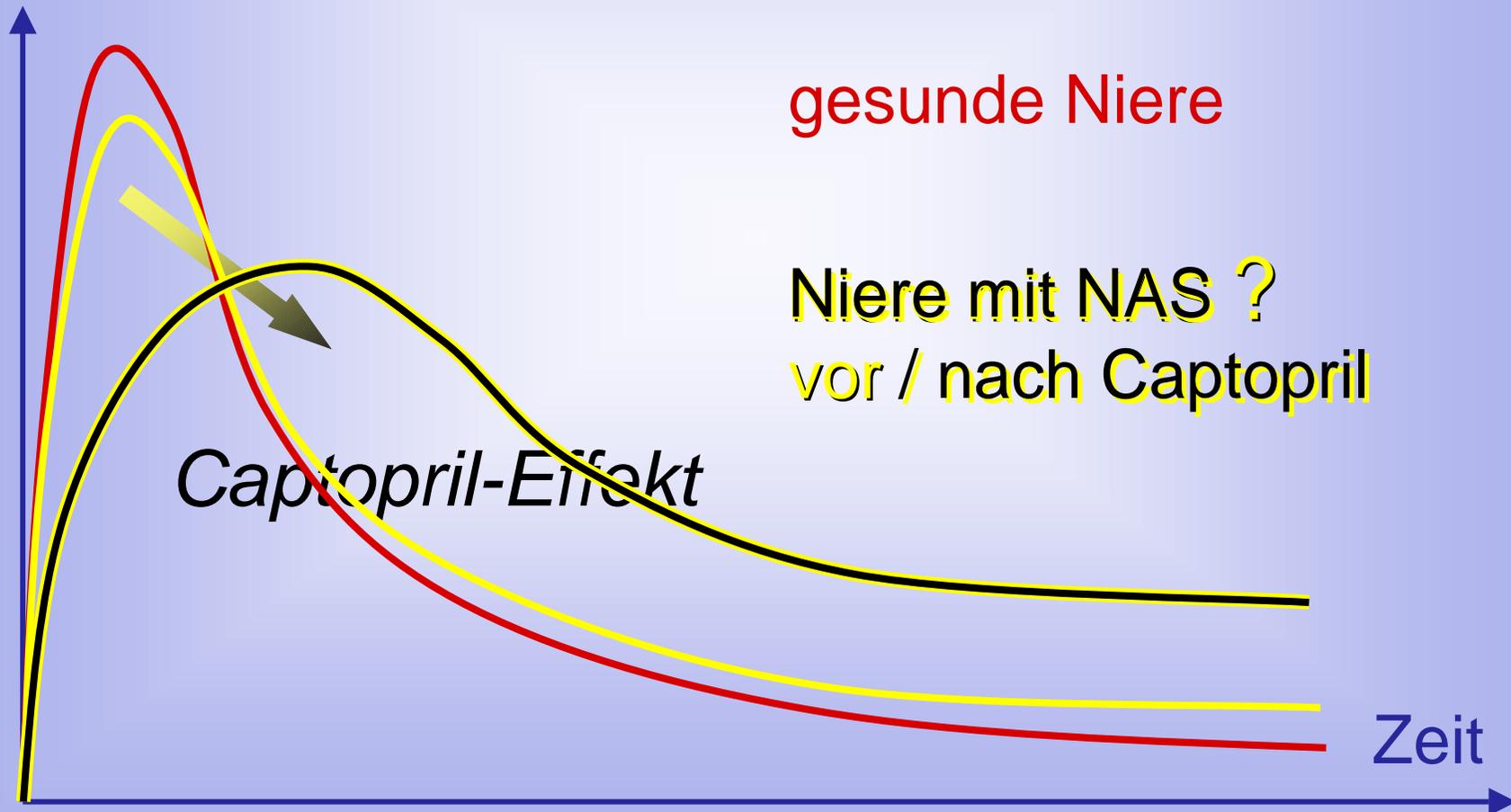
50 mg Captopril, Szintigraphie 1 h p.o.

- ⇒ Clearancereduktion ipsilateral
- ⇒ Tracerretention bei NAS > 60%

*(Sfakianakis, JNM 1987, 28: 1383:
„Sensitivität & Spezifität 100%“)*

Captopril-Test zur Diagnose einer renovaskulären Hypertonie

Aktivität



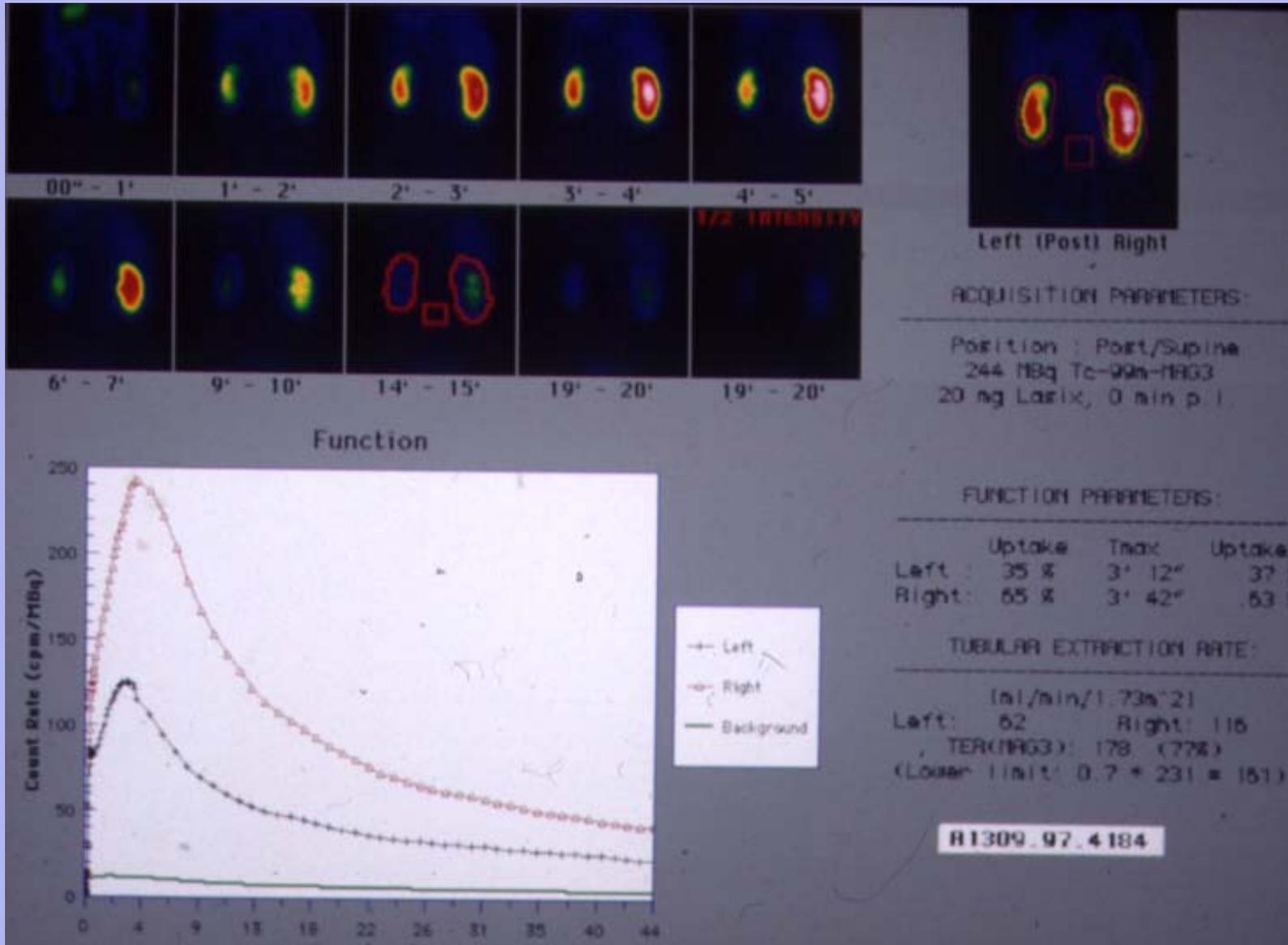
gesunde Niere

Niere mit NAS ?
vor / nach Captopril

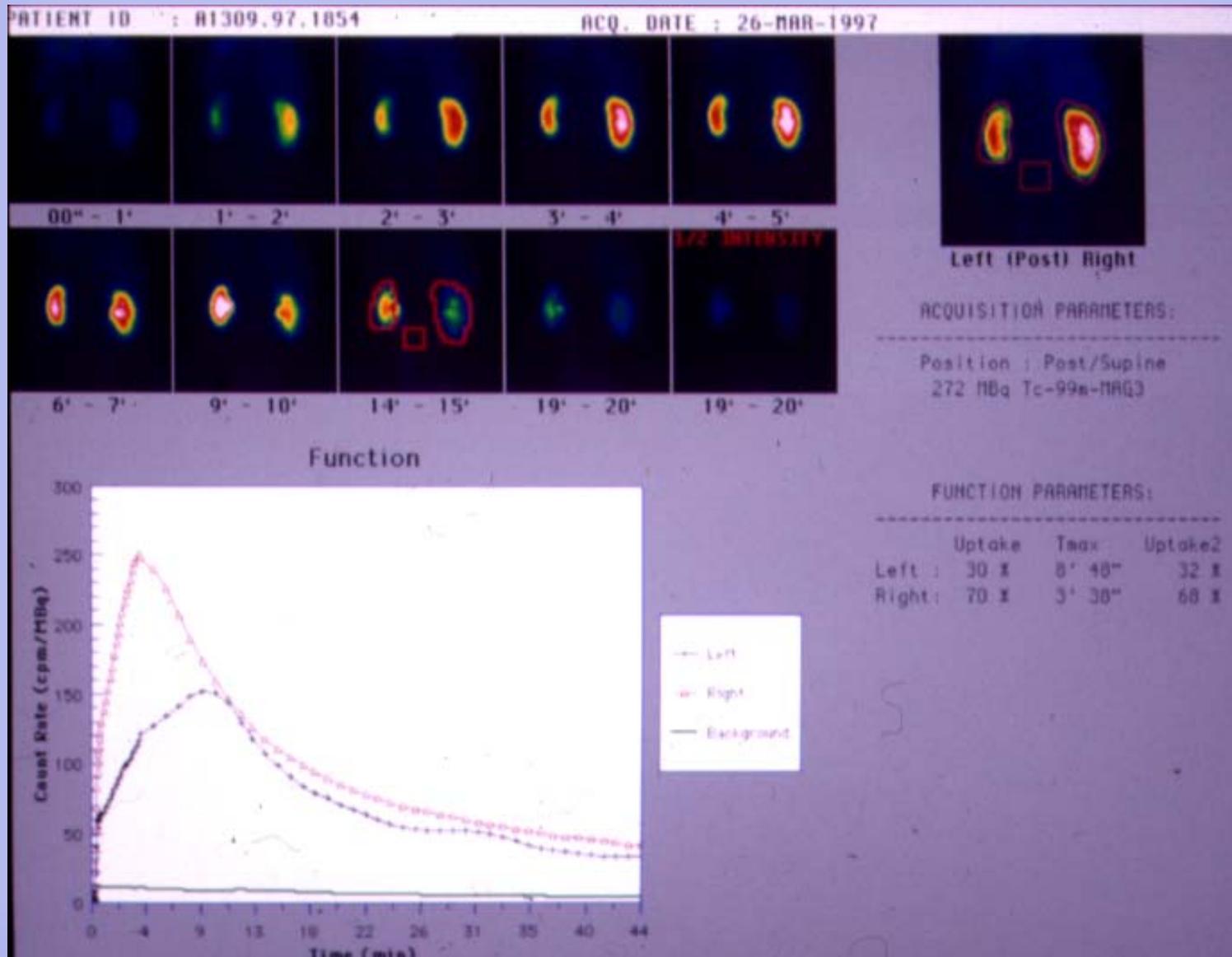
Captopril-Effekt

Zeit

Kleine Niere links, NAS?

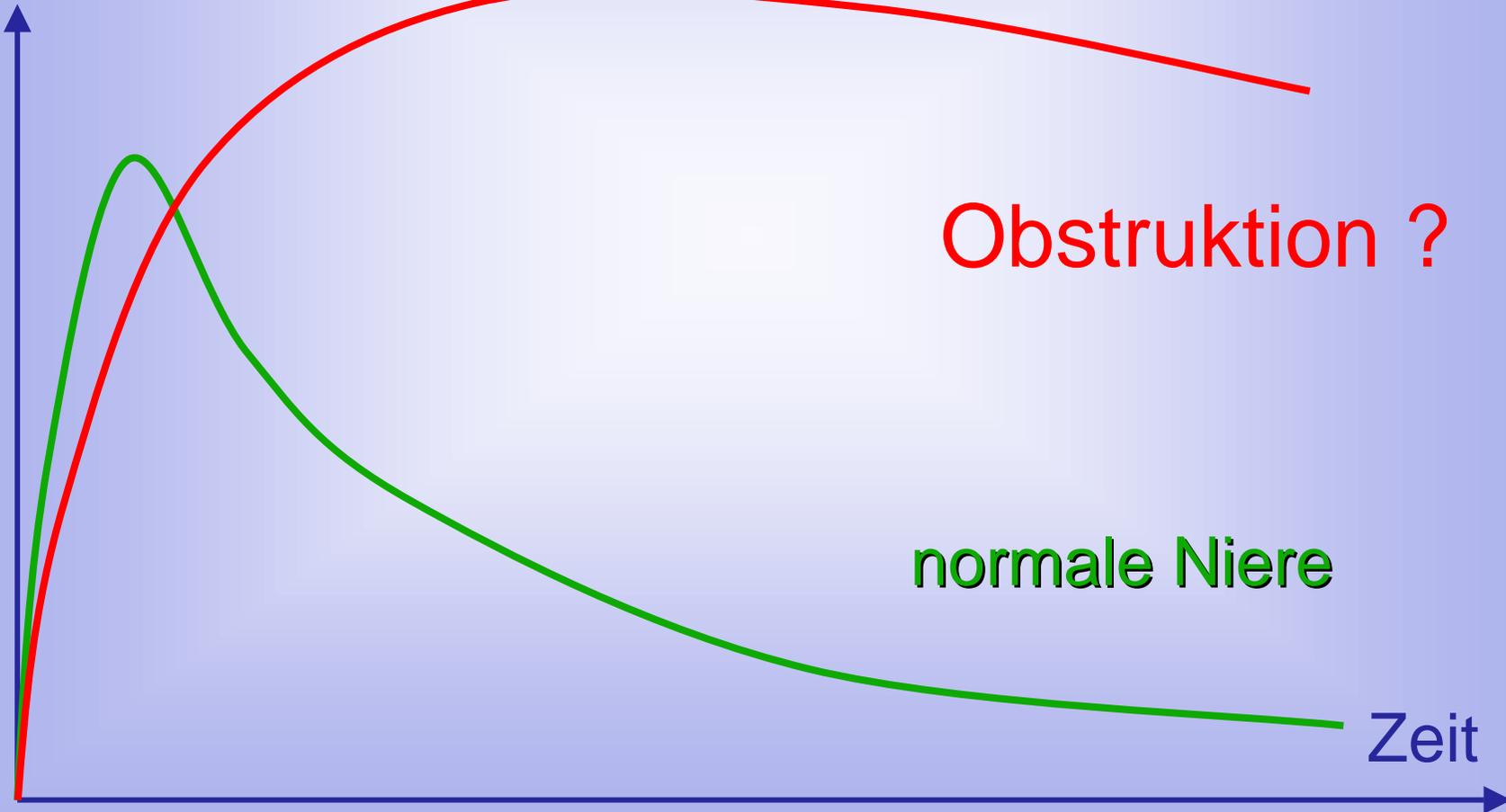


Captopril-Test: NAS links

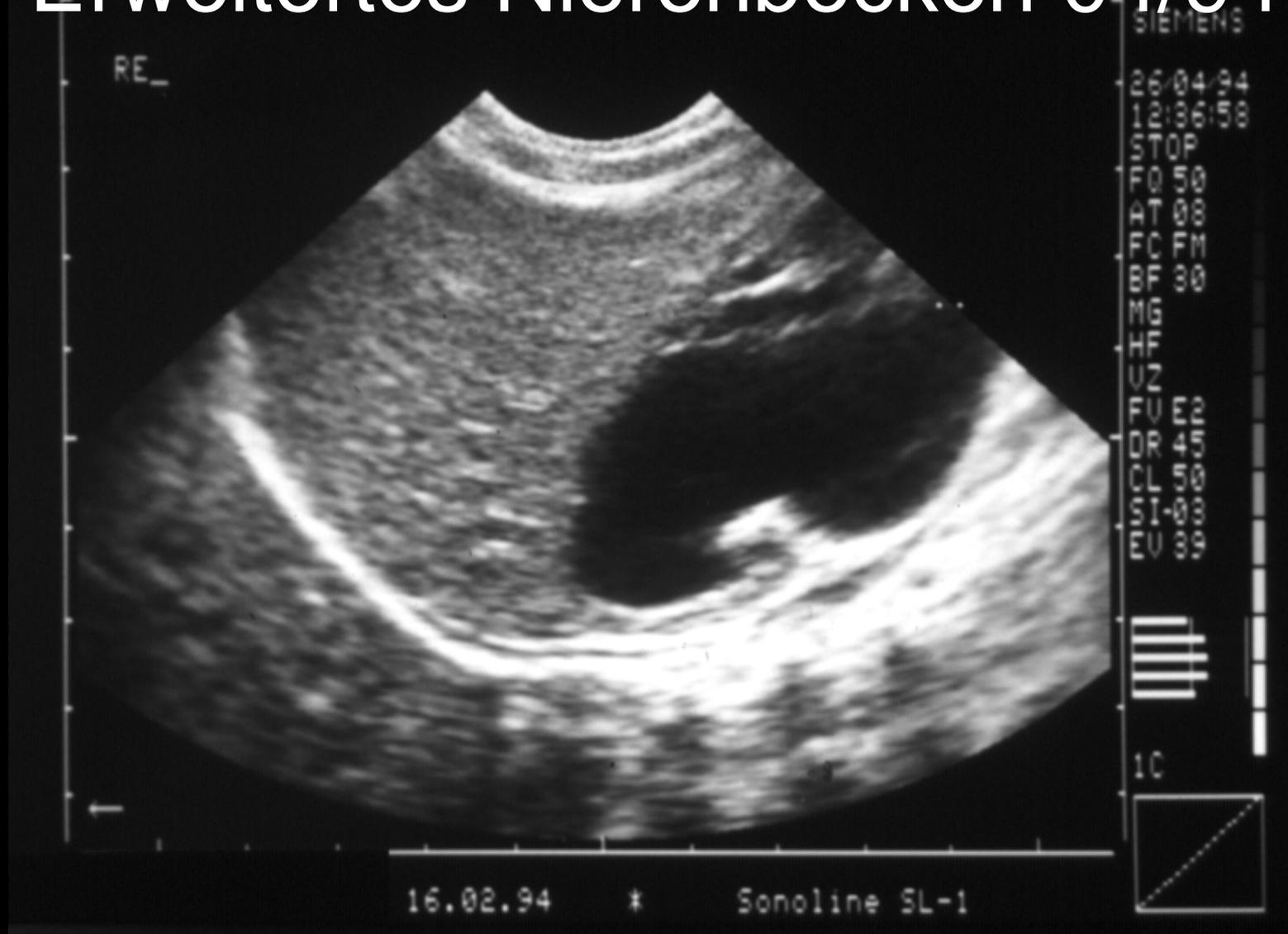


Nephrogramm bei V.a. Obstruktion

Aktivität

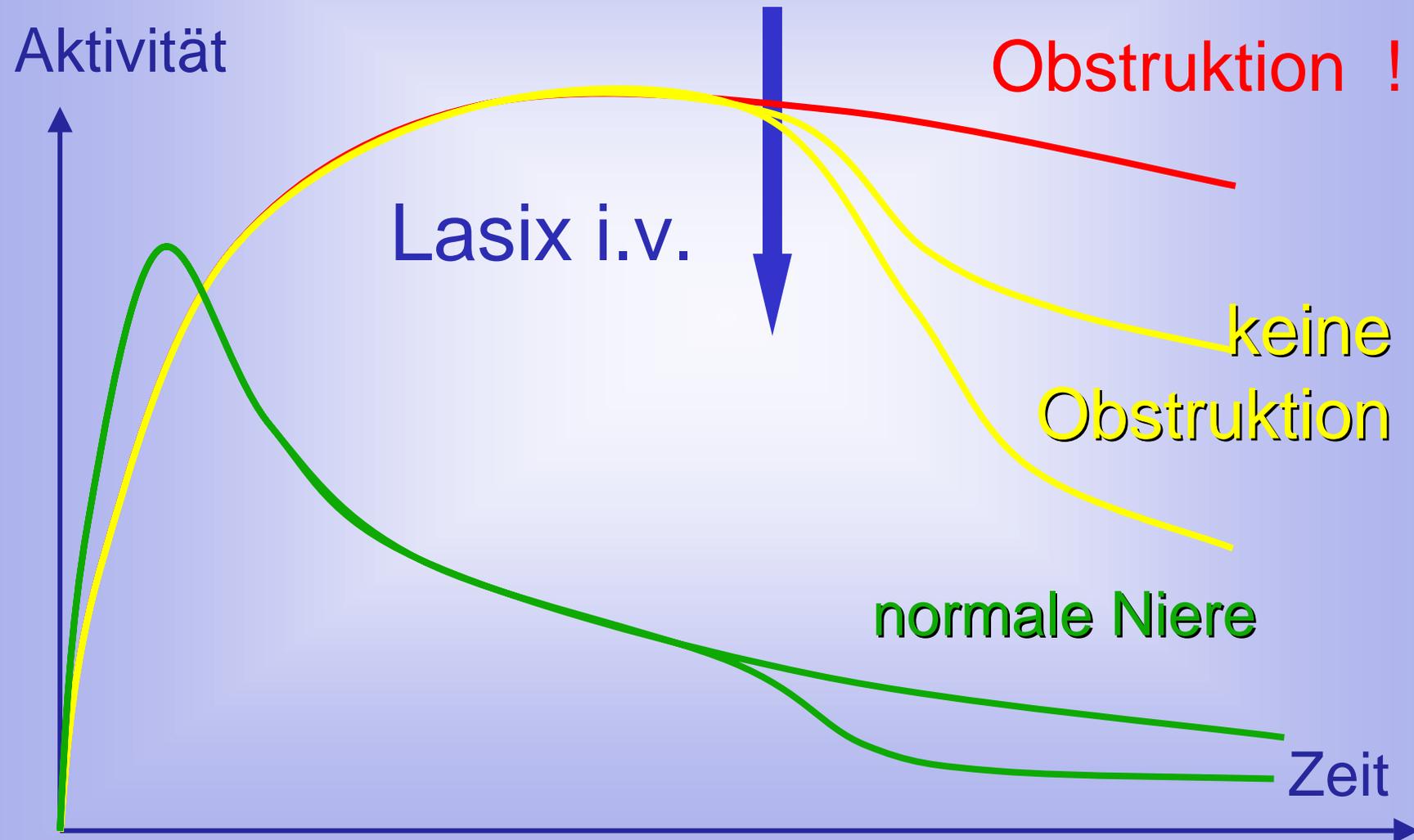


Erweitertes Nierenbecken 04/94

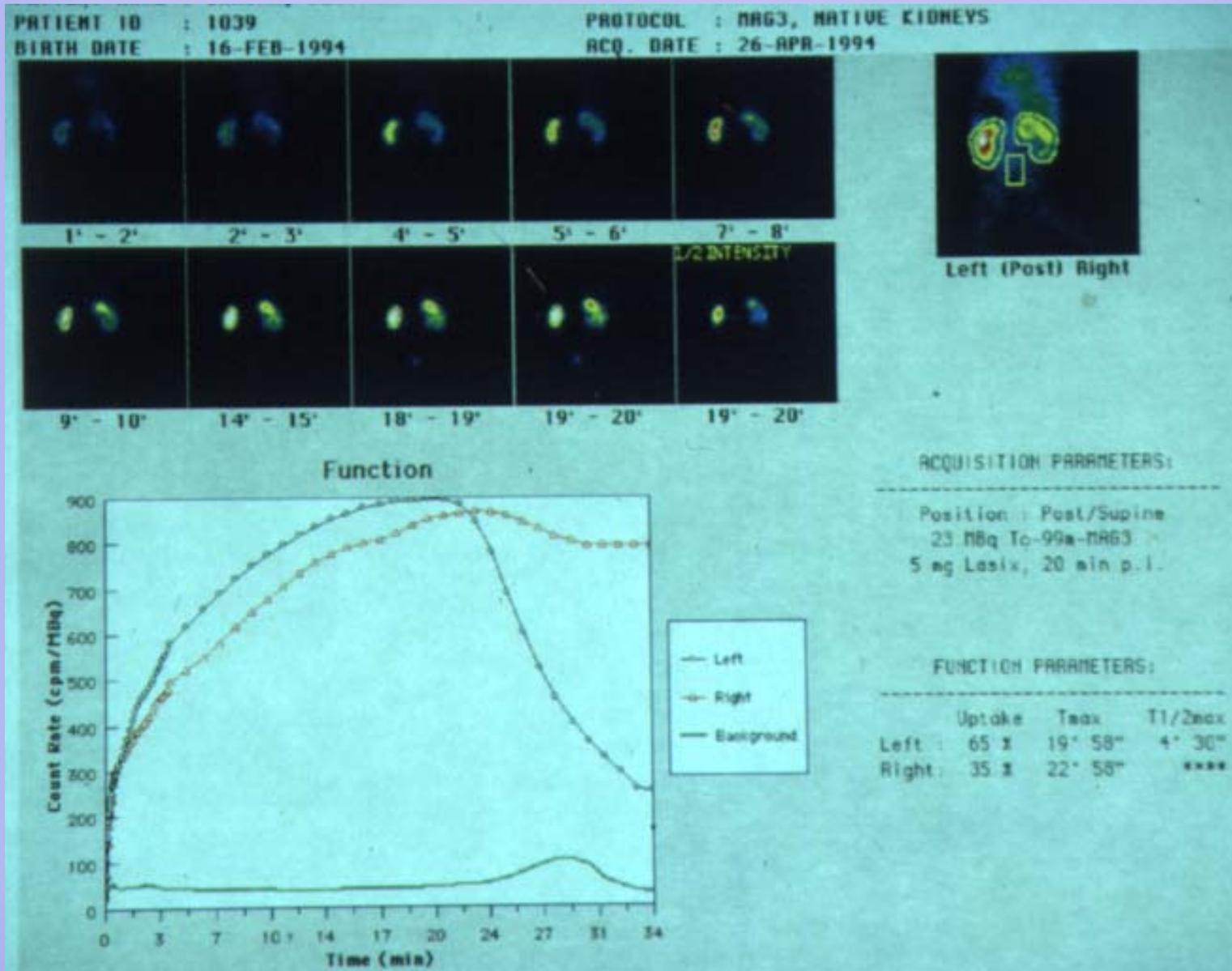


6 Monate altes Kind

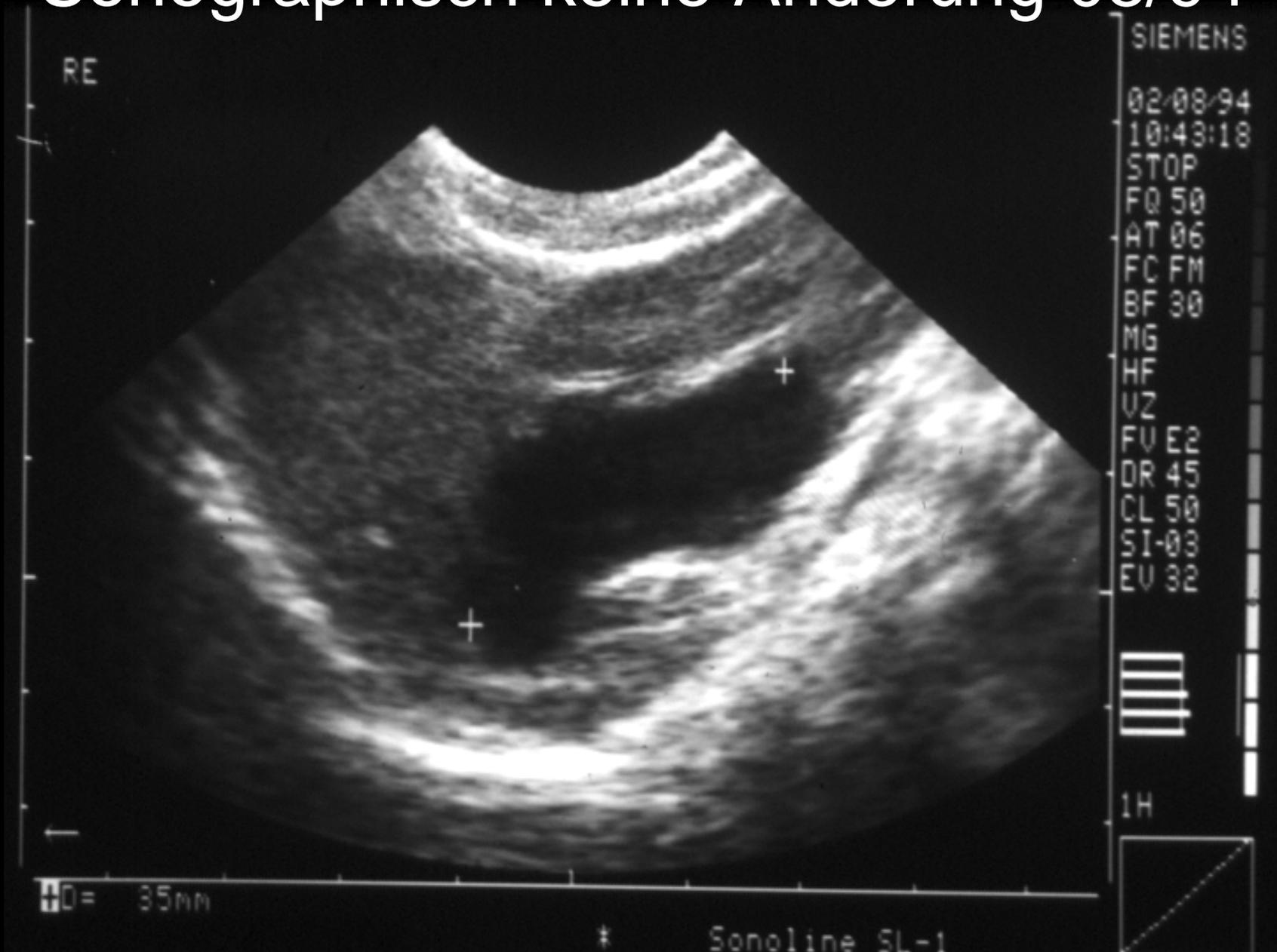
Lasixuntersuchung bei V.a. Obstruktion



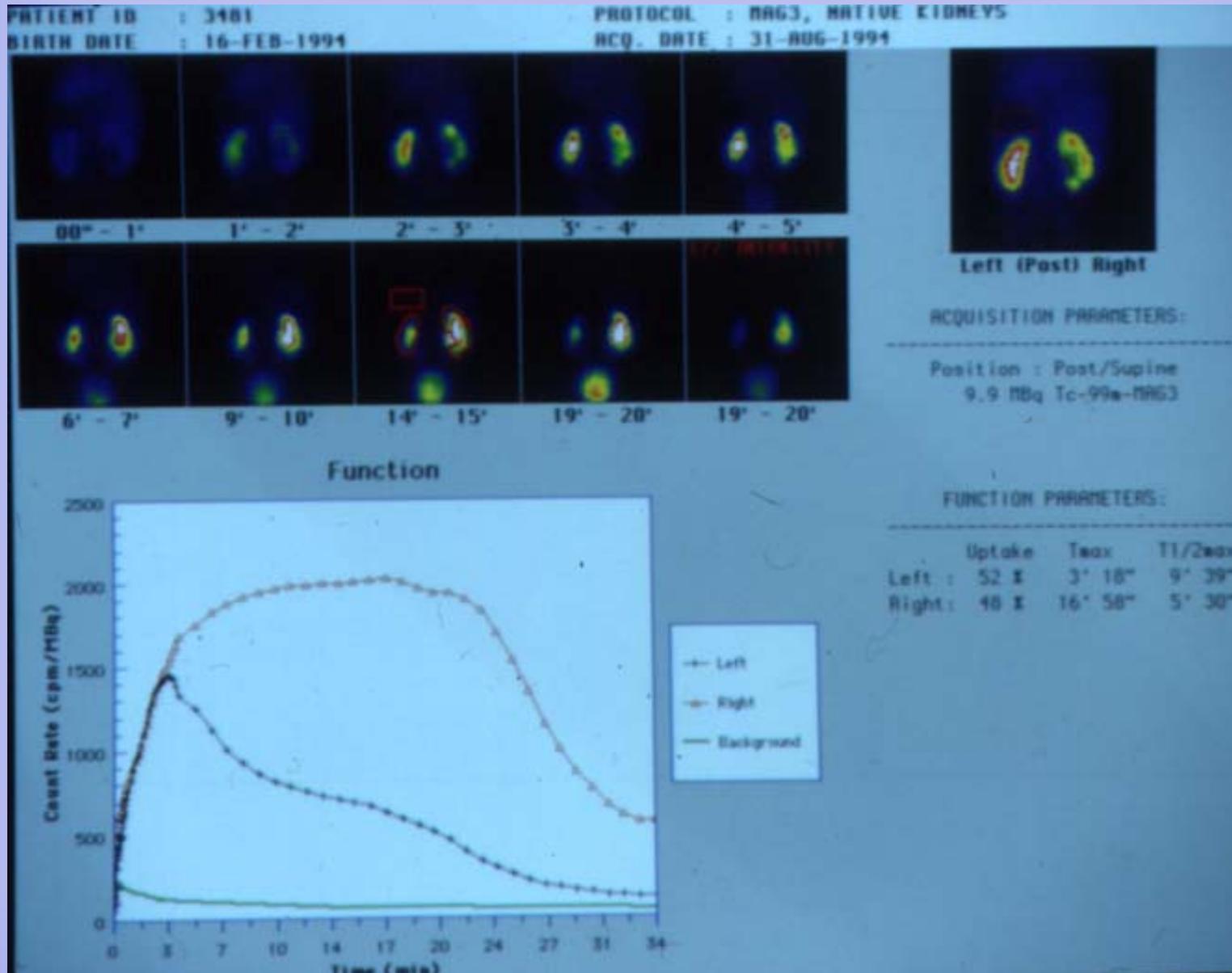
Mäßige Reaktion auf Lasix, keine Op



Sonographisch keine Änderung 08/94



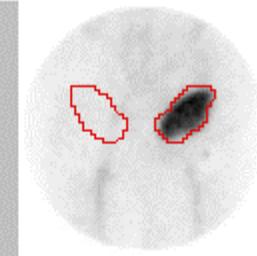
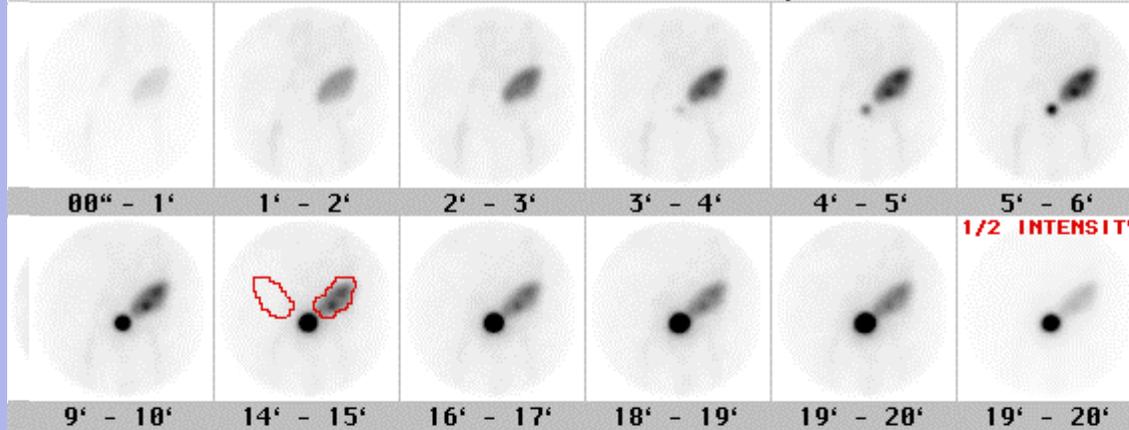
Szintigraphisch Abfluß gebessert



Verlaufskontrolle nach NTX

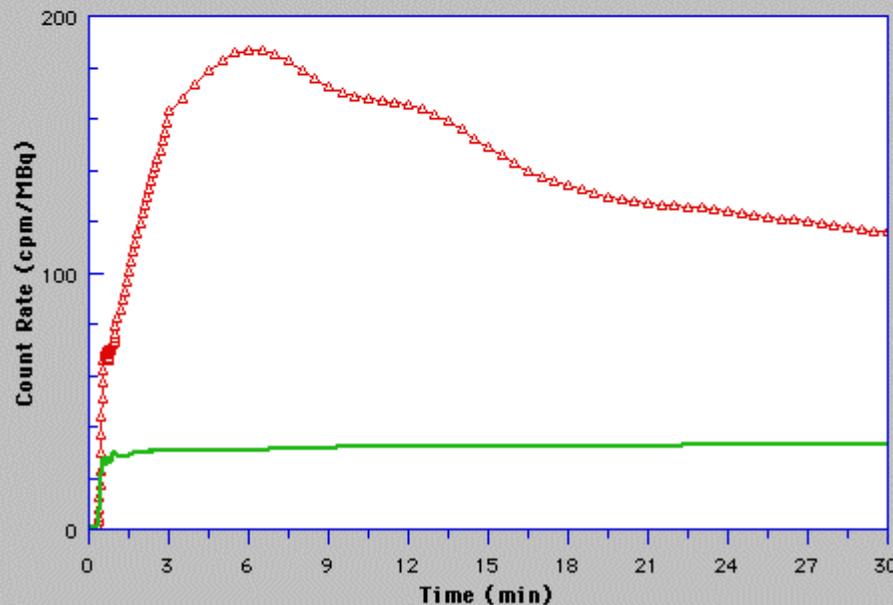
BIRTH DATE : 11-JUN-1936

ACQ. DATE : 13-SEP-2001



Right (Ant) Left

Renal Transplant Function



ACQUISITION PARAMETERS:

Position: Anterior/Supine
240 MBq Tc-99m-MAG3

CURVE PARAMETERS:

Tmax : 5' 40"
T1/2 : ****

RENAL TRANSPLANT INDICES:

Perfusion TP: 1.9
Function TF: 0.6

15 Monate nach NTX

DMSA-Szintigraphie

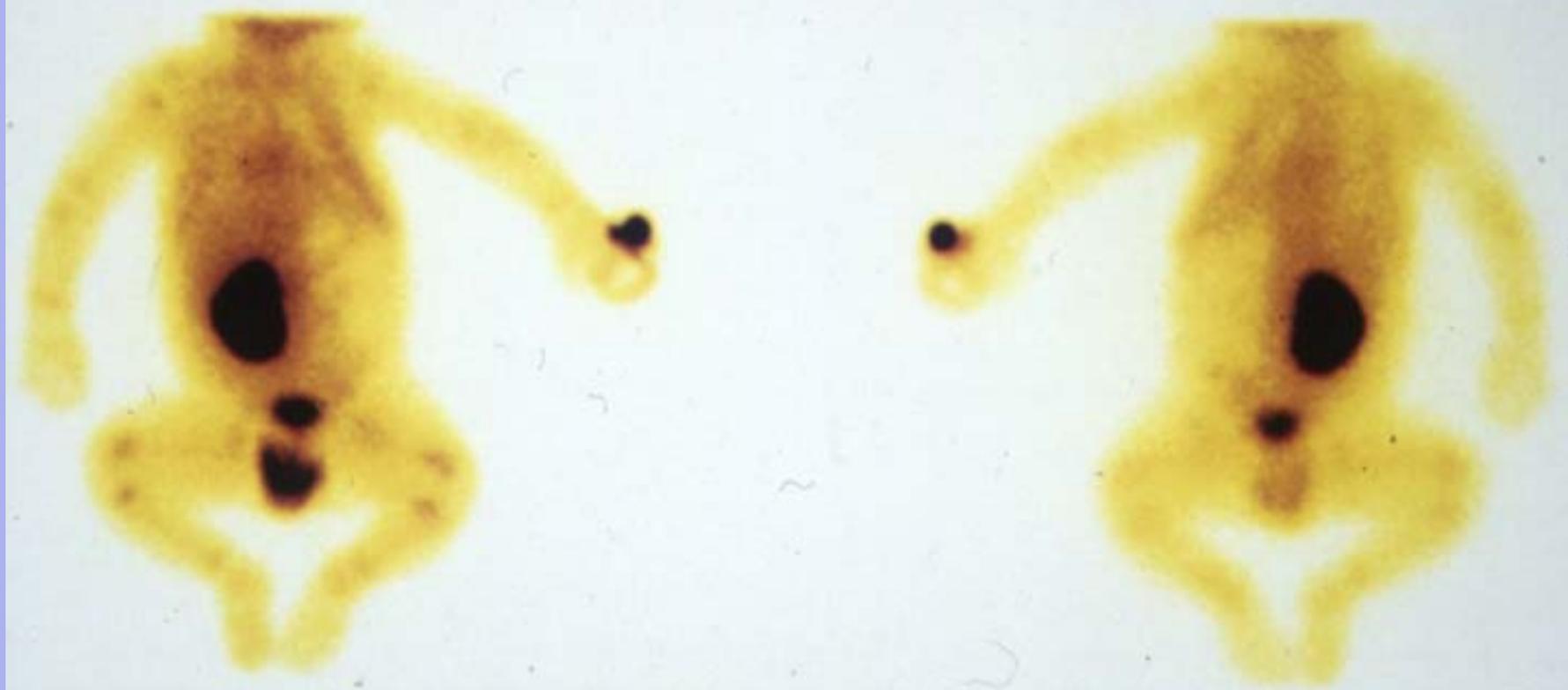


fehlende
Niere rechts

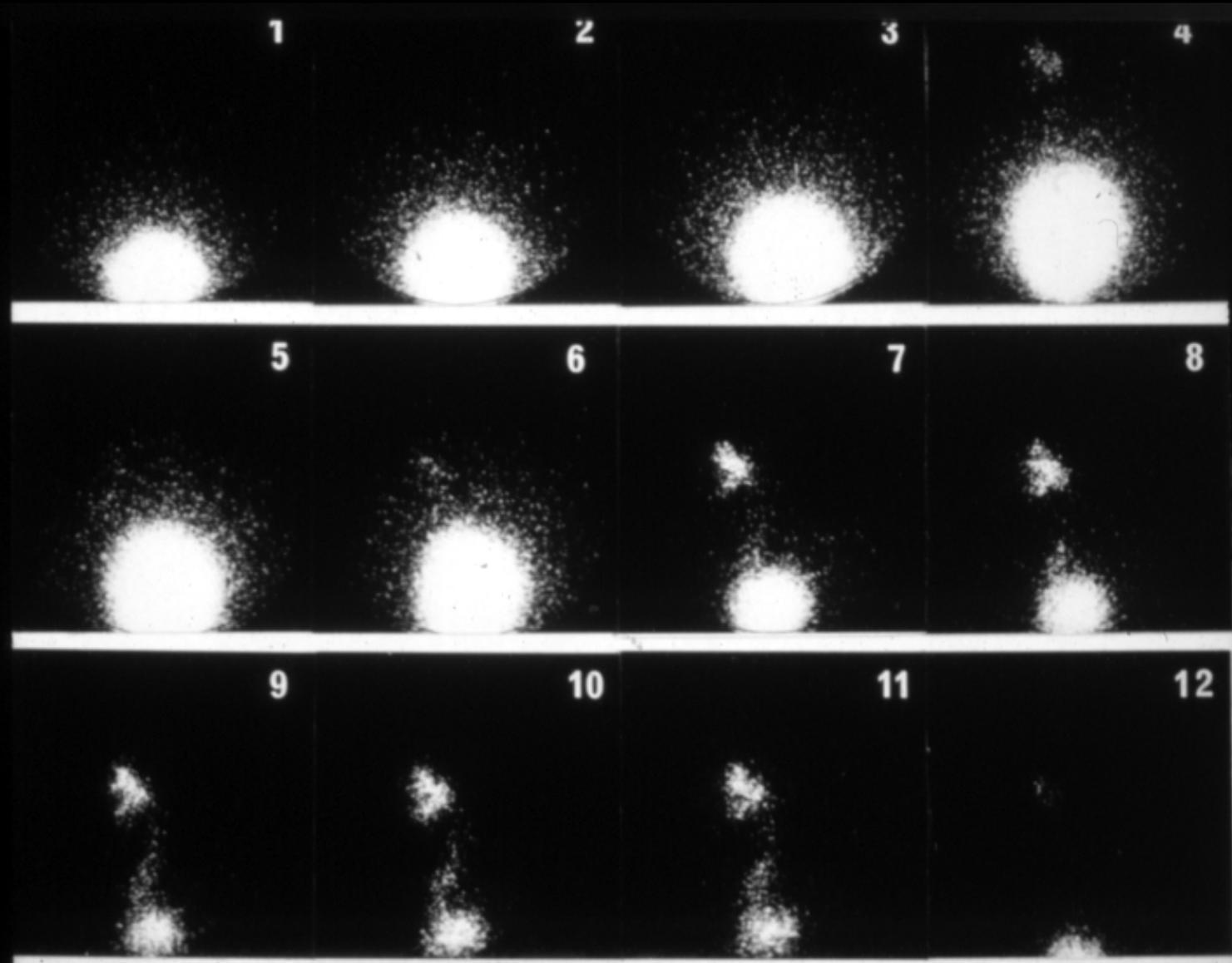
DMSA-Szintigraphie

PATIENT ID : A3500.98.5606

ACQ. DATE : 20-OCT-1998



MCU



Strahlenexposition (mGy)

	<i>Ovarien</i>	<i>Testes</i>	<i>Km_{rot}</i>	<i>Blase</i>	<i>Haut</i>
i.v. Pyelogramm	10	3	2	10	50
Pyelographie mit Hodenkapsel			0.2		
MCU (Röntgen)	3	6			
DSA der Niere	4	1			
Angiographie Niere	30	12	10	30	300
CT gonadenfern	1	1			
CT Gonaden im Strahl	300	300			
Sequenzszintigraphie					
20 MBq J123-OIH	0.3	0.2	0.4	5.0	0.2
40 MBq Tc99m-MAG3	0.03	0.05		0.03	

Nuklearmedizin in der Diagnose von Erkrankungen der Niere

⇒ globale Funktion

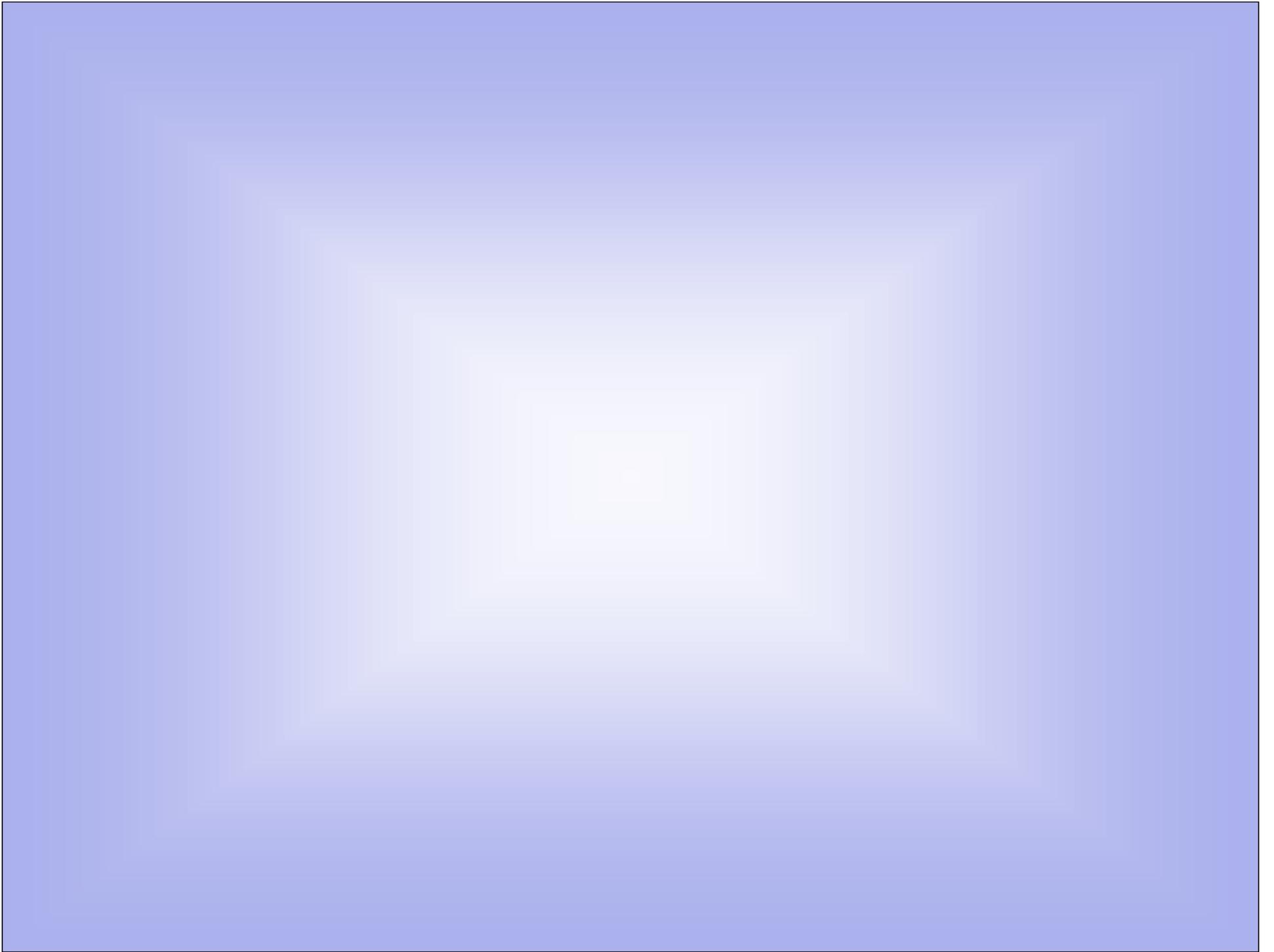
(Transportstörung prä / intra / postrenal)

⇒ seitengetrennte Funktion

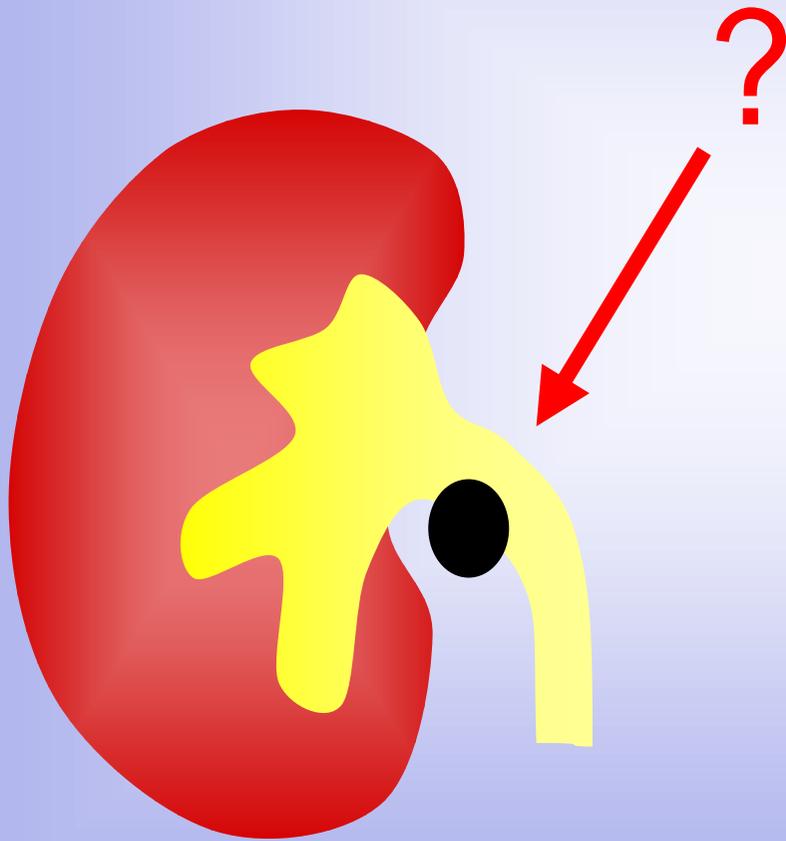
⇒ renovaskulärer Hochdruck

⇒ erweitertes NBKS

⇒ Refluxdiagnostik



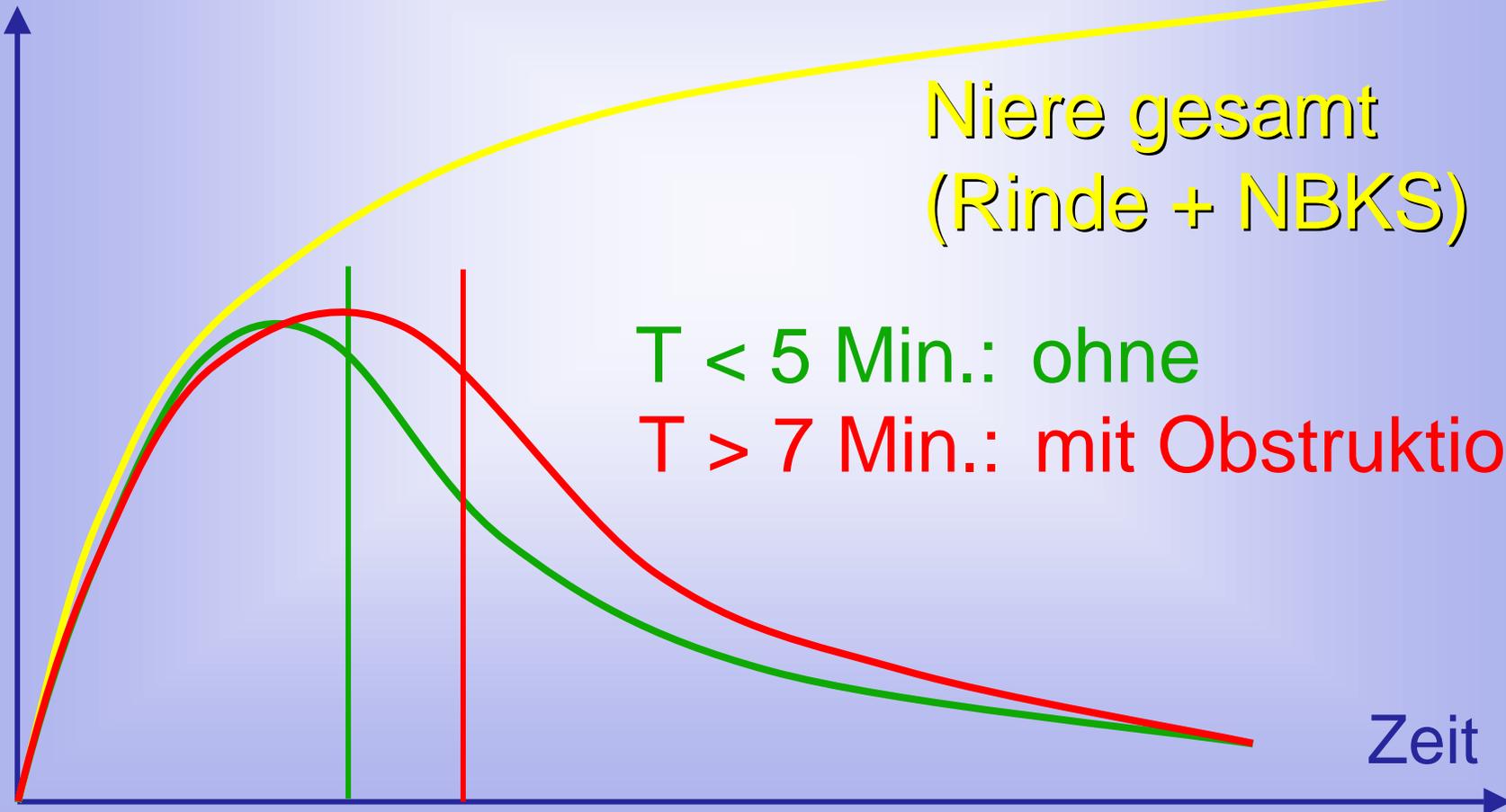
Transitzeit T zur Diagnose einer Obstruktion



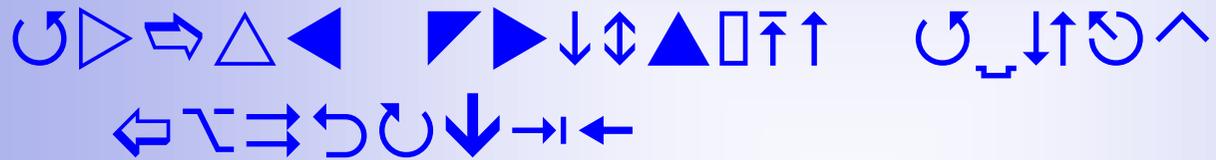
$$T = \frac{\int t A(t) dt}{\int A(t) dt}$$

Transitzeit T zur Diagnose einer Obstruktion

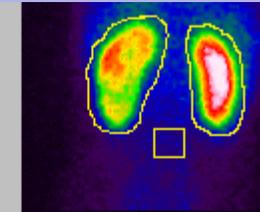
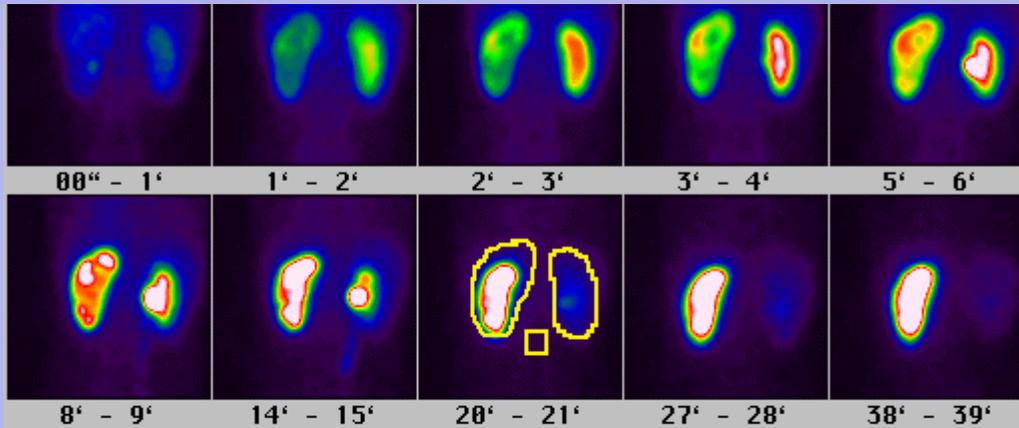
Aktivität



wing



Ureter-Abgangsstenose



Left (Post) Right

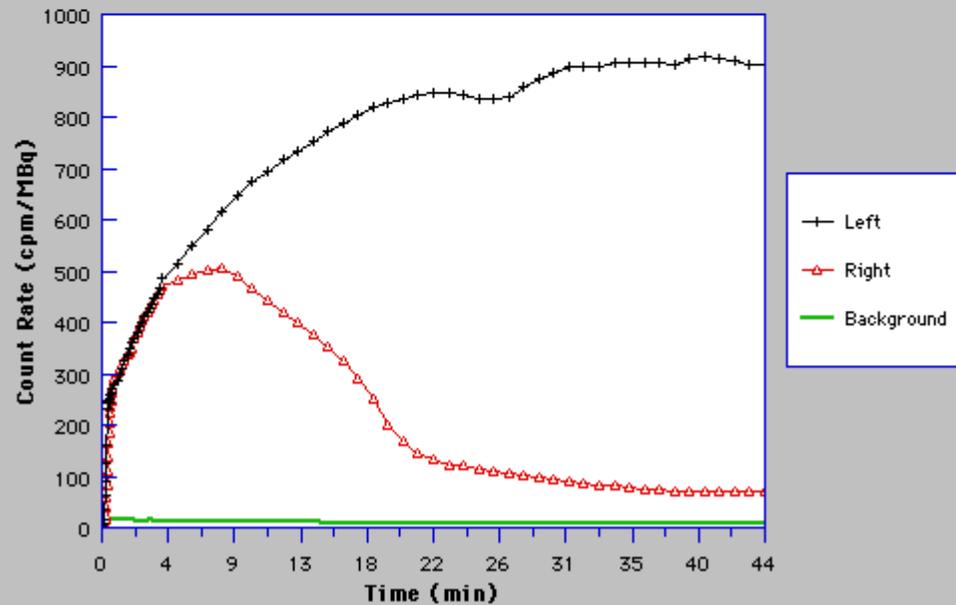
ACQUISITION PARAMETERS:

Position : Post/Supine
 130 MBq Tc-99m-MAG3
 15 mg Lasix, 15 min p.i.

FUNCTION PARAMETERS:

	Uptake	Tmax	Uptake2
Left :	53 %	39' 46"	50 %
Right :	47 %	7' 46"	50 %

Function



Sequenzszintigraphie nach Nierentransplantation

- Differenzierung einer Funktionsstörung
 - prärenal Minderperfusion
 - intrarenal tubuläre Schädigung
 - postrenal Abflußstörung
- Lecksuche
- Wiederholung problemlos möglich
(keine Kontrastmittelschädigung)
- postoperative Verlaufskontrolle

Nephrologie / Urologie

- globale Nierenfunktion

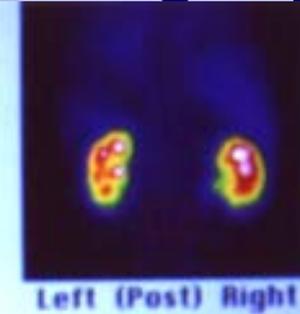
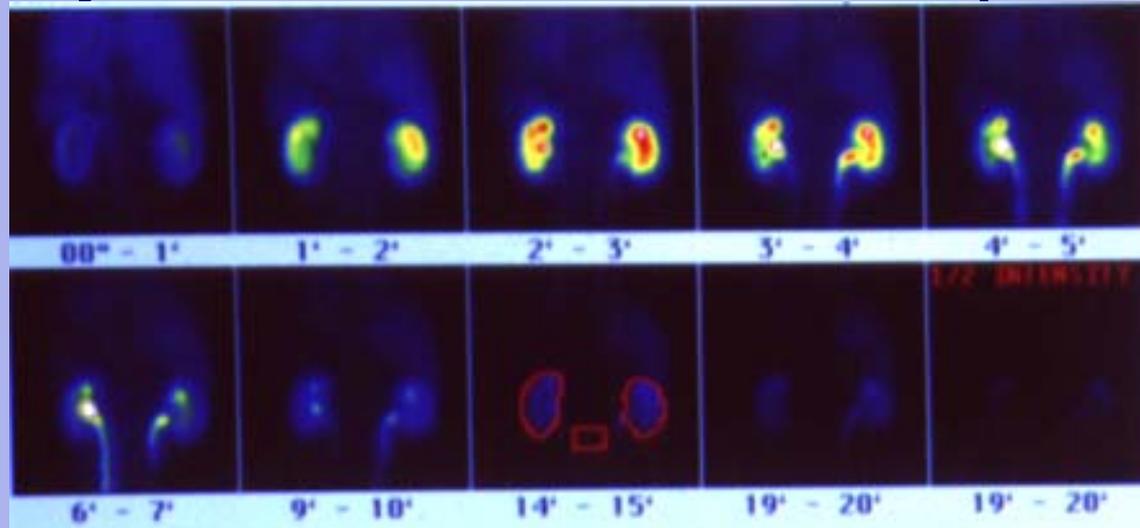
Tc99m-DTPA \Rightarrow Inulin-Clearance \Rightarrow GFR

I-123-OIH \Rightarrow PAH-Clearance \Rightarrow ERPF

Tc99m-MAG3 \Rightarrow “tubuläre Extraktion“

- seitengetrennte Funktion
- regionale Funktion bei Doppelniere
- Abflußverhältnisse (Stenose / weites NBKS)
- Refluxdiagnostik

Dynamische Nierensequenzszintigraphie



ACQUISITION PARAMETERS:

Position : Post/Supine
250 MBq Tc-99m-MAG3

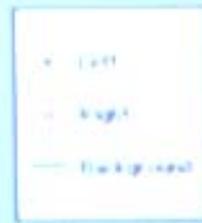
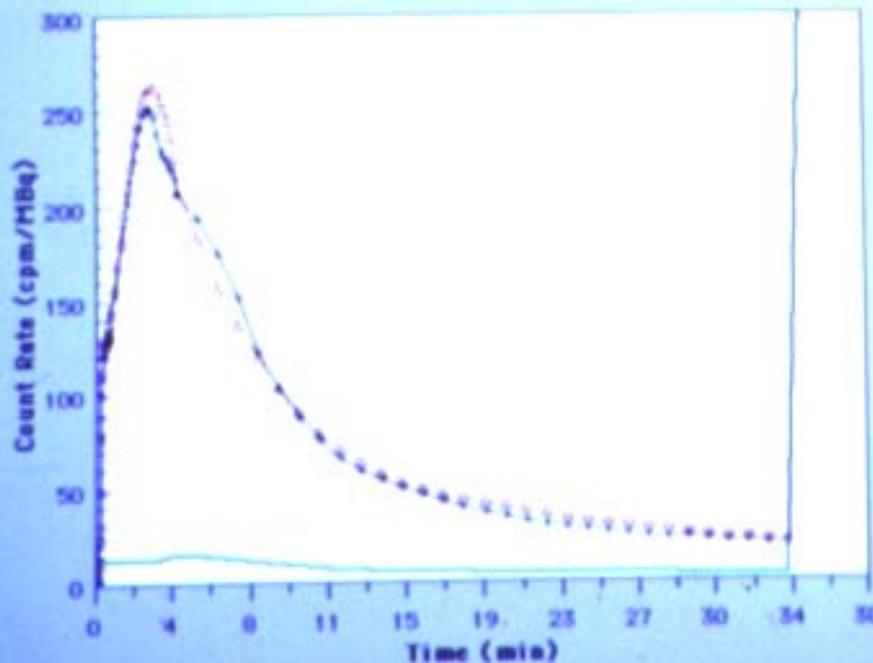
FUNCTION PARAMETERS:

	Uptake	T _{max}	T _{1/2max}
Left :	48 %	2' 24"	****
Right :	52 %	2' 44"	****

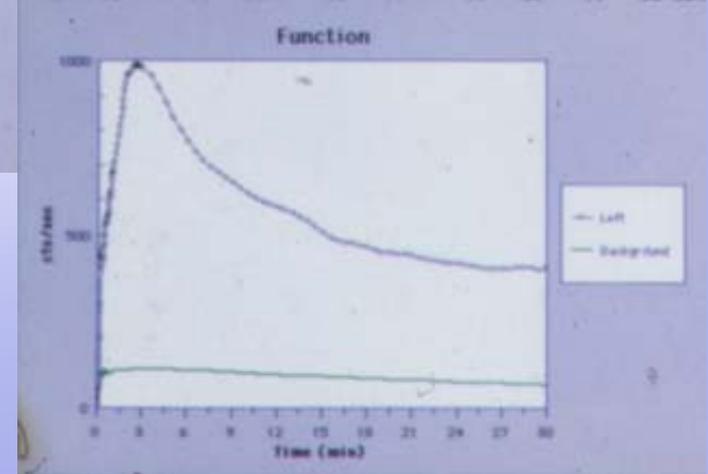
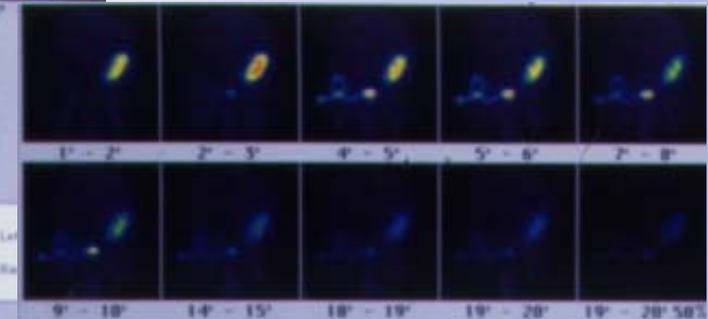
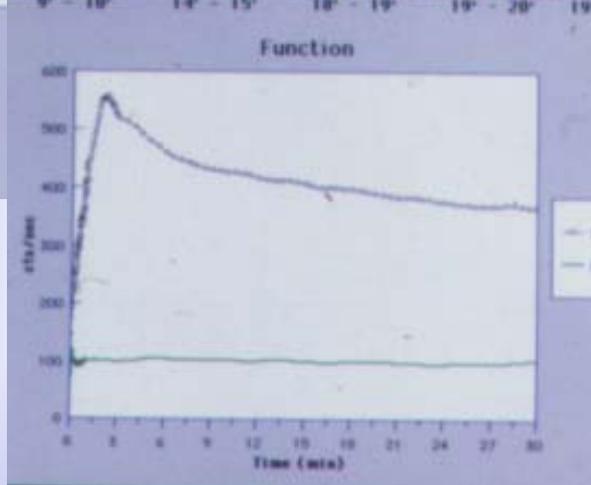
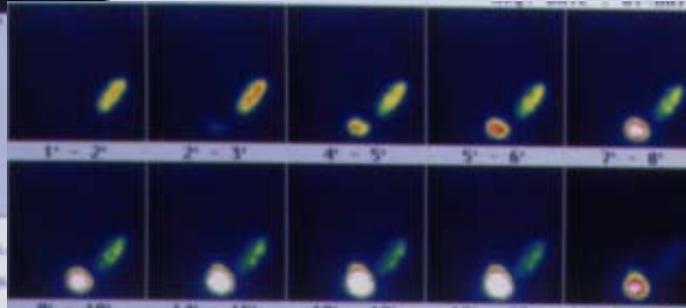
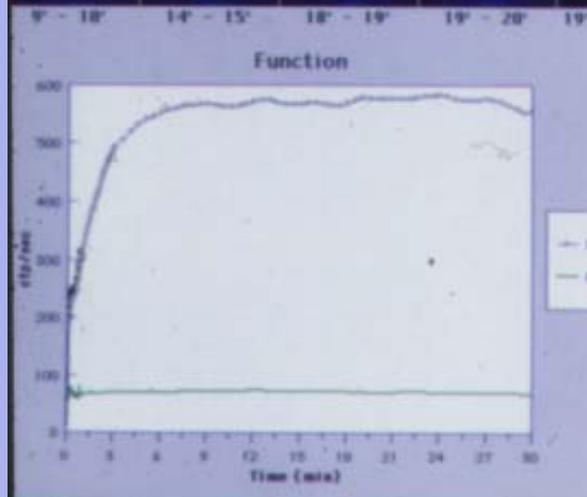
TUBULAR EXTRACTION RATE:

[ml/min/1.73m ²]	
Left:	115
Right:	124
TER(MAG3): 239 (84%)	
(Lower limit: 0.7 * 283 = 198)	

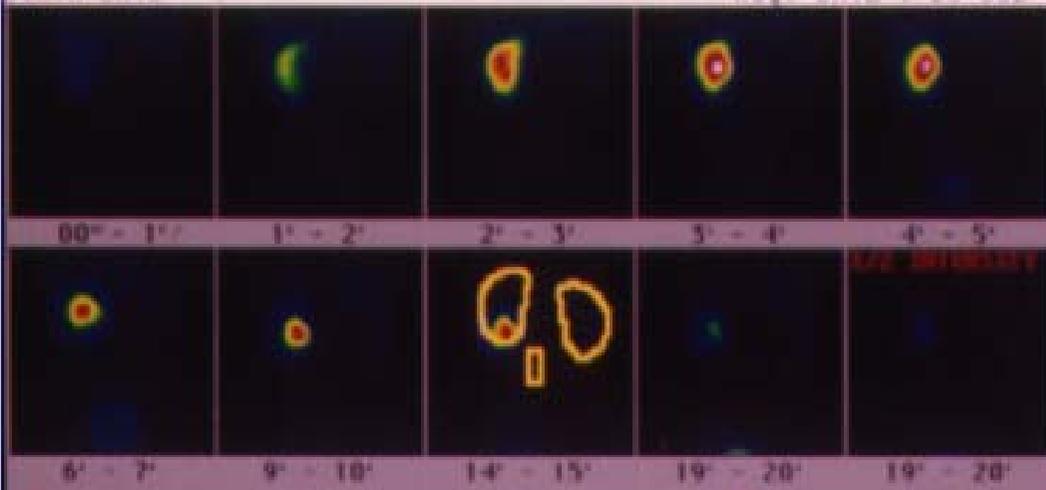
Function



Verlaufskontrolle nach Nierentransplantation



PATIENT NAME :
 PATIENT ID : A2646.96.3953
 BIRTH DATE :
 INSTITUTE : UNI GIESSEN, ABT. NUKLEARMEDIZIN, PROF. D
 PROTOCOL : MAG3, NATIVE KIDNEYS
 ACQ. DATE : 23-JUL-1996

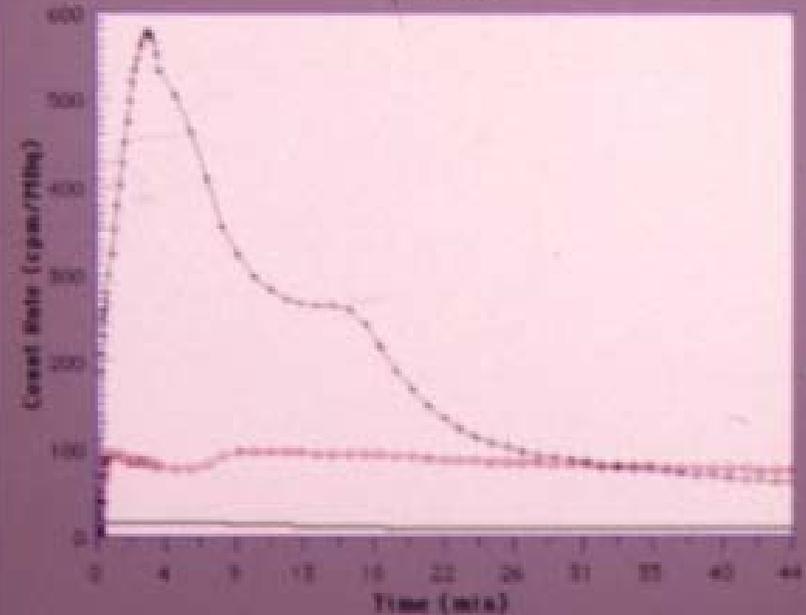


Left (Post) Right

ACQUISITION PARAMETERS

Position : Post/Supine
 100 MBq Tc-99m-MAG3
 16 mg Lasix, 15 min p.i.

Function



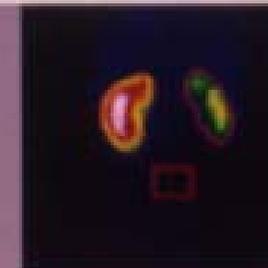
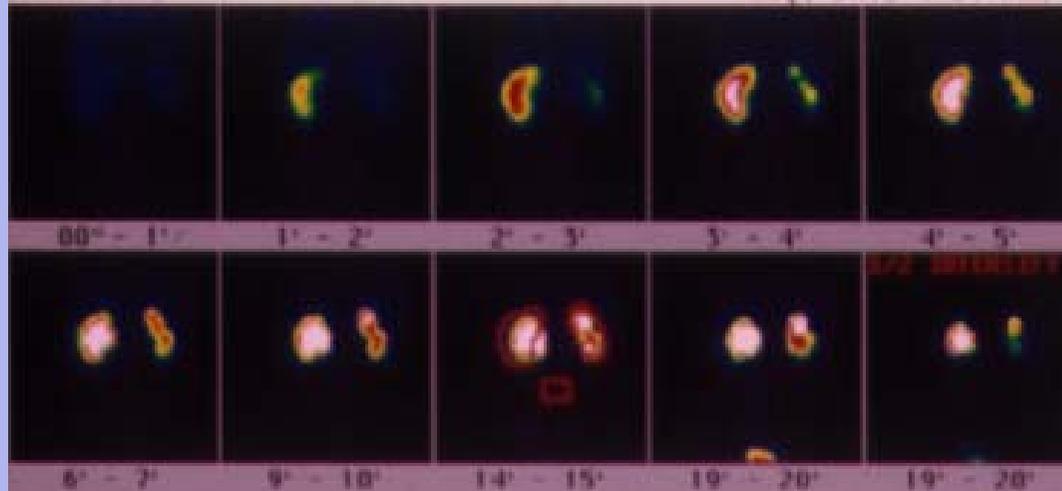
--- Left
 — Right
 — Background

FUNCTION PARAMETERS

	Uptake	Time	Uptake2
Left :	96 ±	3' 00"	81 ±
Right :	4 ±	10' 40"	10 ±

PATIENT ID : R1266.97.1787
BIRTH DATE :

PROTOCOL : MAG3, NATIVE KIDNEYS
ACQ. DATE : 24-MAR-1997

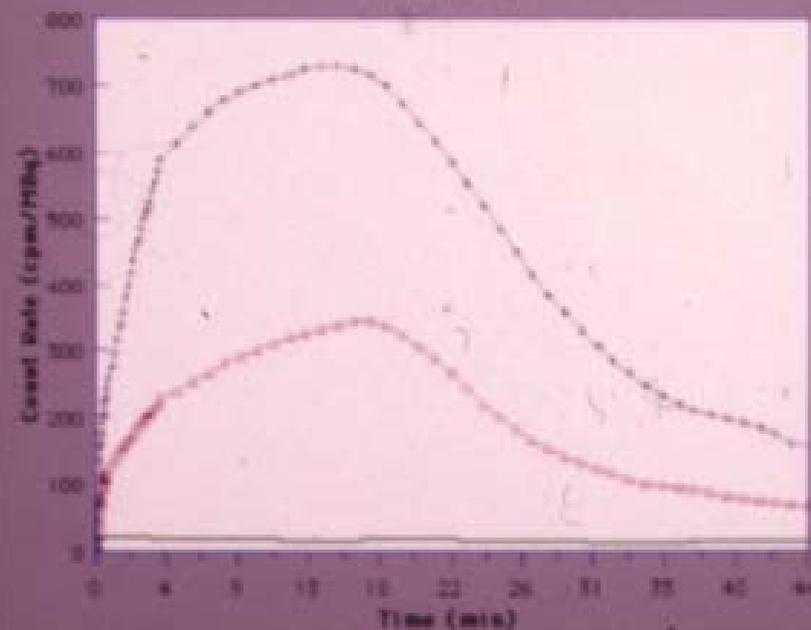


Left (Post) Right

ACQUISITION PARAMETERS:

Position : Post/Supine
84.5 MBq Tc-99m-MAG3
12 mg Lasix, 10 min p.i.

Function

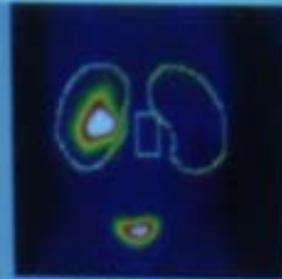
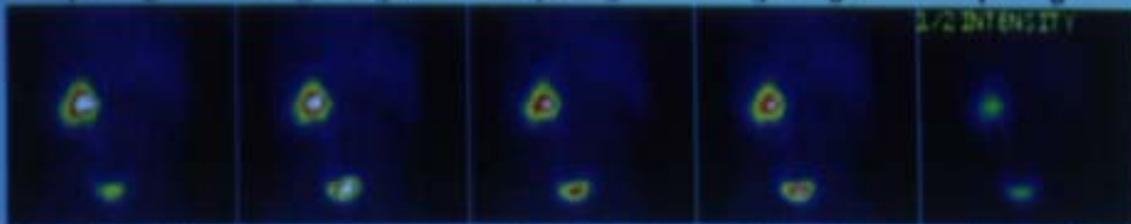
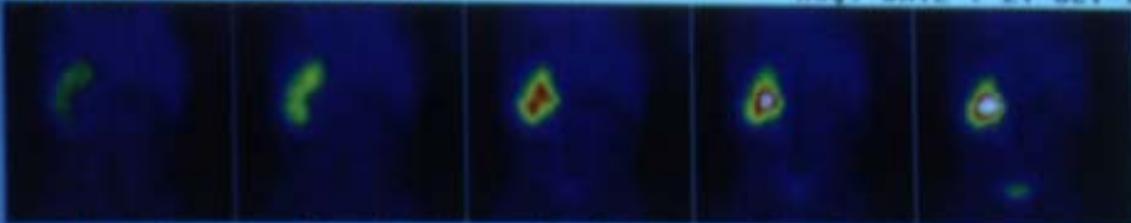


FUNCTION PARAMETERS:

	Uptake	T _{1/2}	Uptake2
Left	72 %	14' 50"	69 %
Right	28 %	15' 56"	31 %

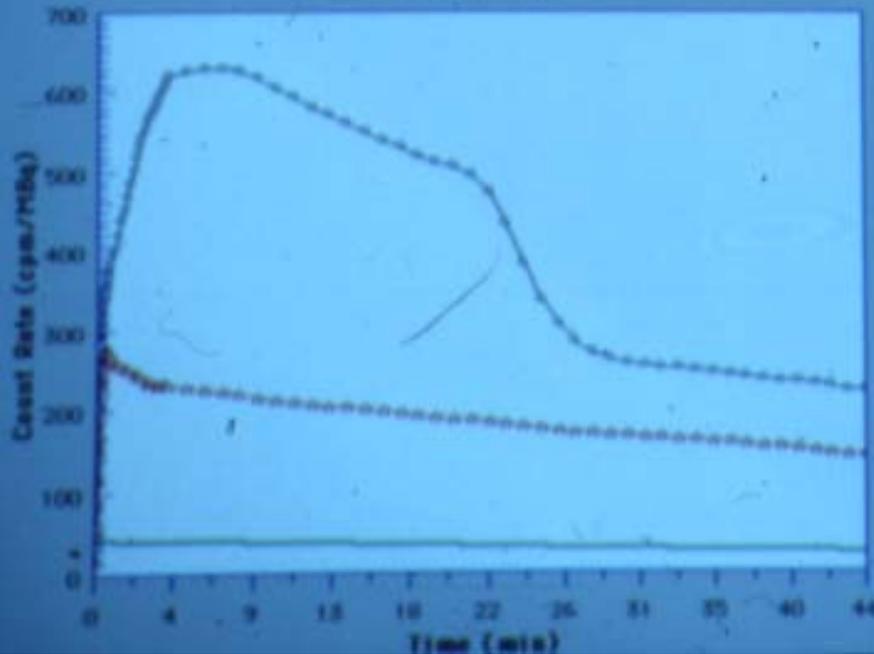
PATIENT ID : 4468
BIRTH DATE : 23-SEP-1994

PROTOCOL : MAG3, NATIVE KIDNEYS
ACQ. DATE : 27-OCT-1994



Left (Post) Right

Function



Left
Right
Background

ACQUISITION PARAMETERS:

Position : Post/Supine
25 MBq Tc-99m-MAG3
2 mg Lasix, 21 min p.i.

FUNCTION PARAMETERS:

	Uptake	T _{max}	T _{1/2max}
Left	100 %	5' 58"	19' 11"
Right	0 %	2' 08"	***

Clearance-Bestimmungen

glomeruläre
Filtration
(GFR)

Inulin-Clearance

Kreatinin-Clearance

$$Cl_{\text{Krea}} = 0.98 Cl_{\text{Inulin}}$$

Cr51-EDTA

Tc99m-DTPA

effektiver renaler
Plasmafluß
(ERPF)

PAH-Clearance

I123-(I131) -OIH

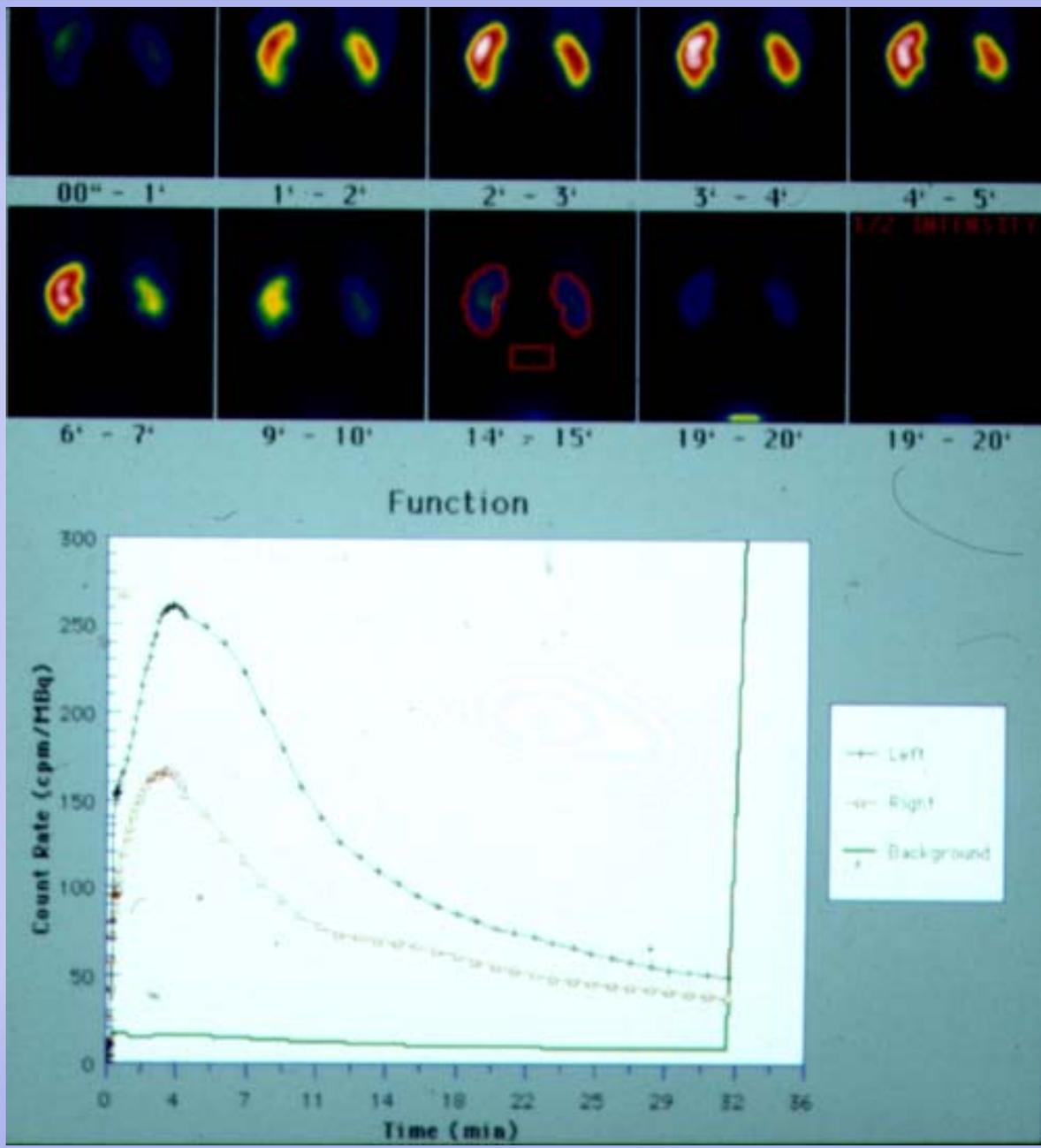
$$Cl_{\text{OIH}} = 0.84 Cl_{\text{PAH}}$$

„tubuläre
Sekretion“

Tc99m-MAG3-
Clearance

$$Cl_{\text{MAG3}} \cong 0.6 Cl_{\text{PAH}}$$

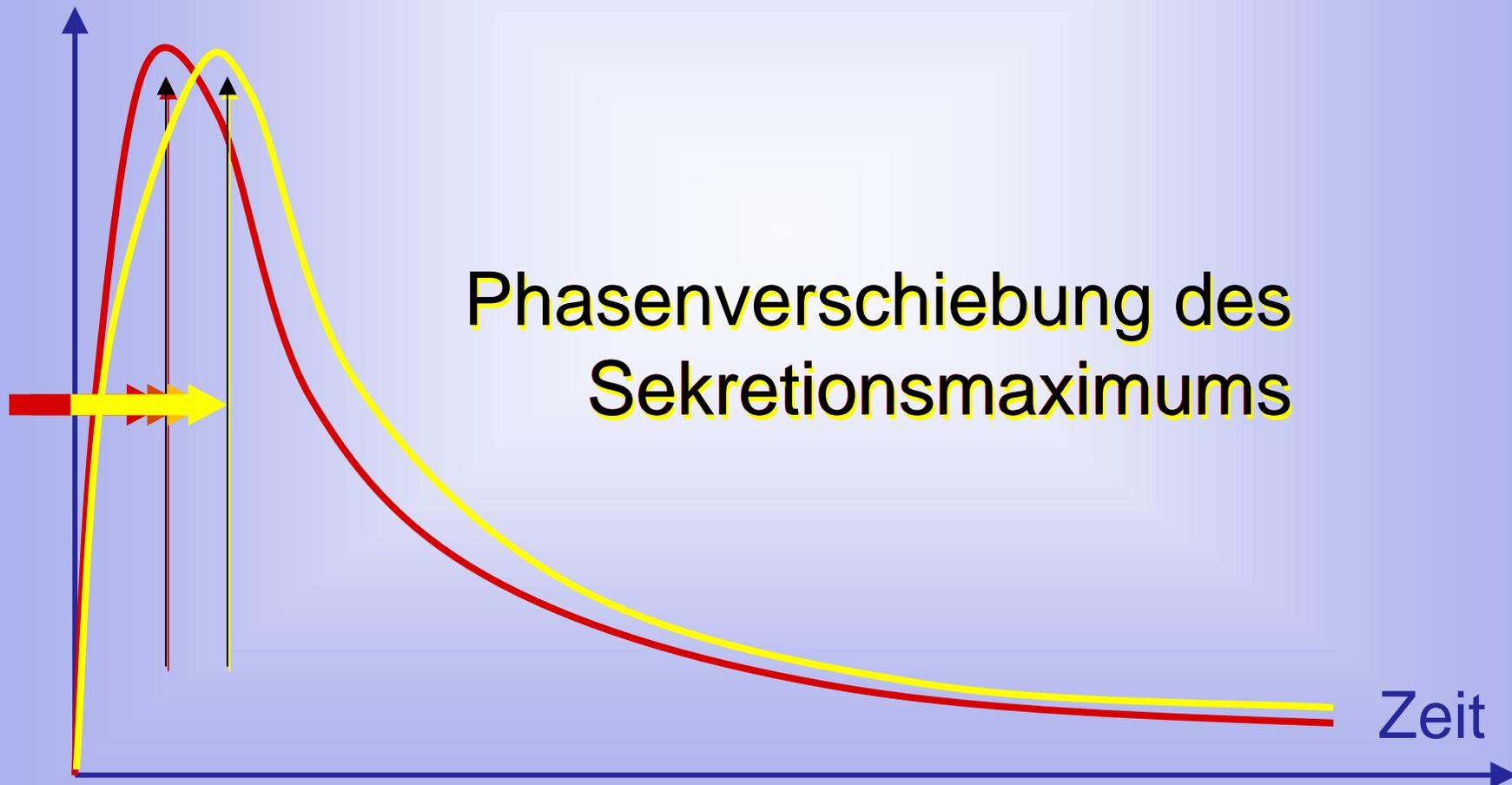
kleine Niere rechts



Funktion proportional zur
Parenchymmasse

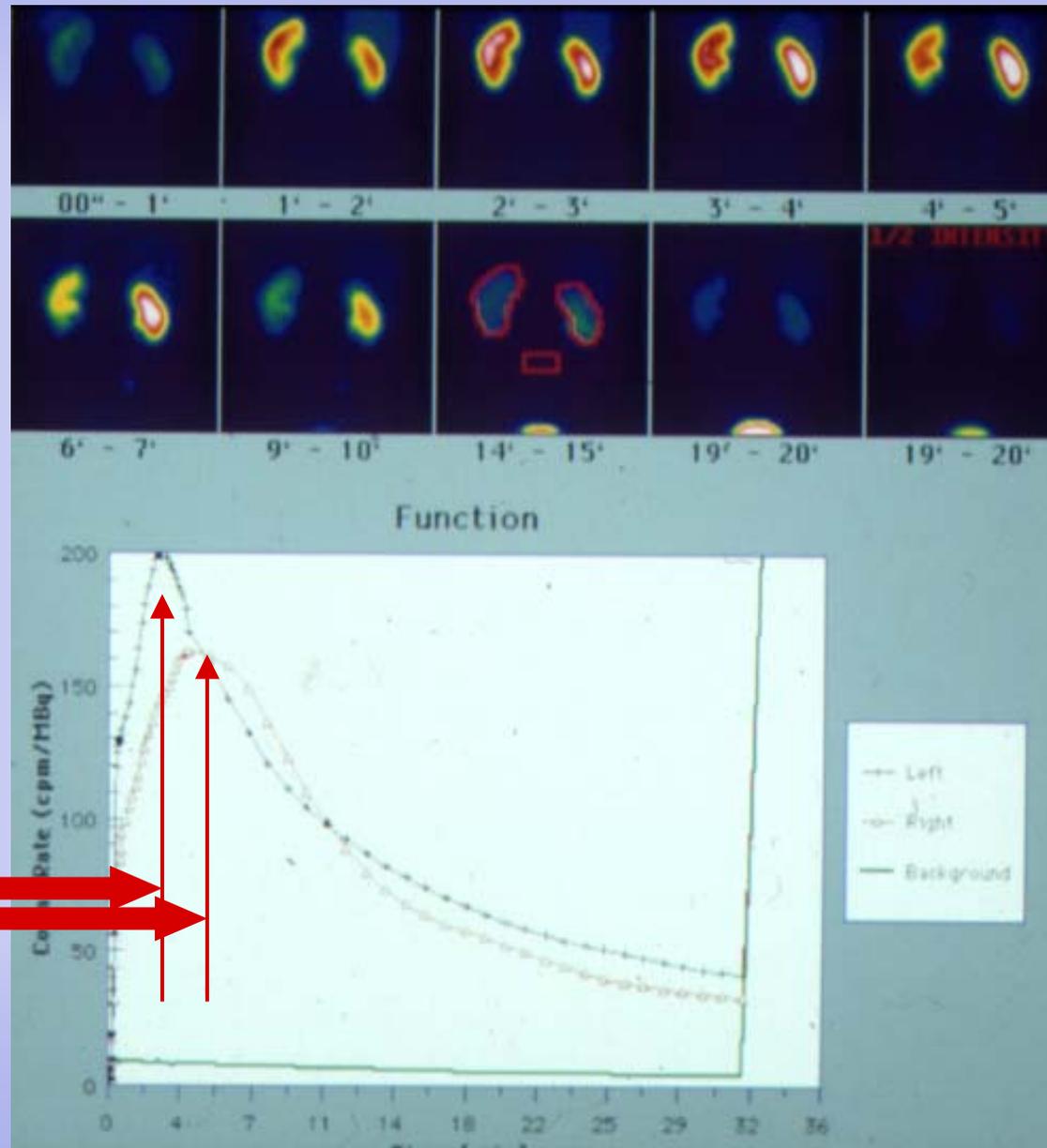
Kameranephrographie bei renovaskulärer Hypertonie

Aktivität

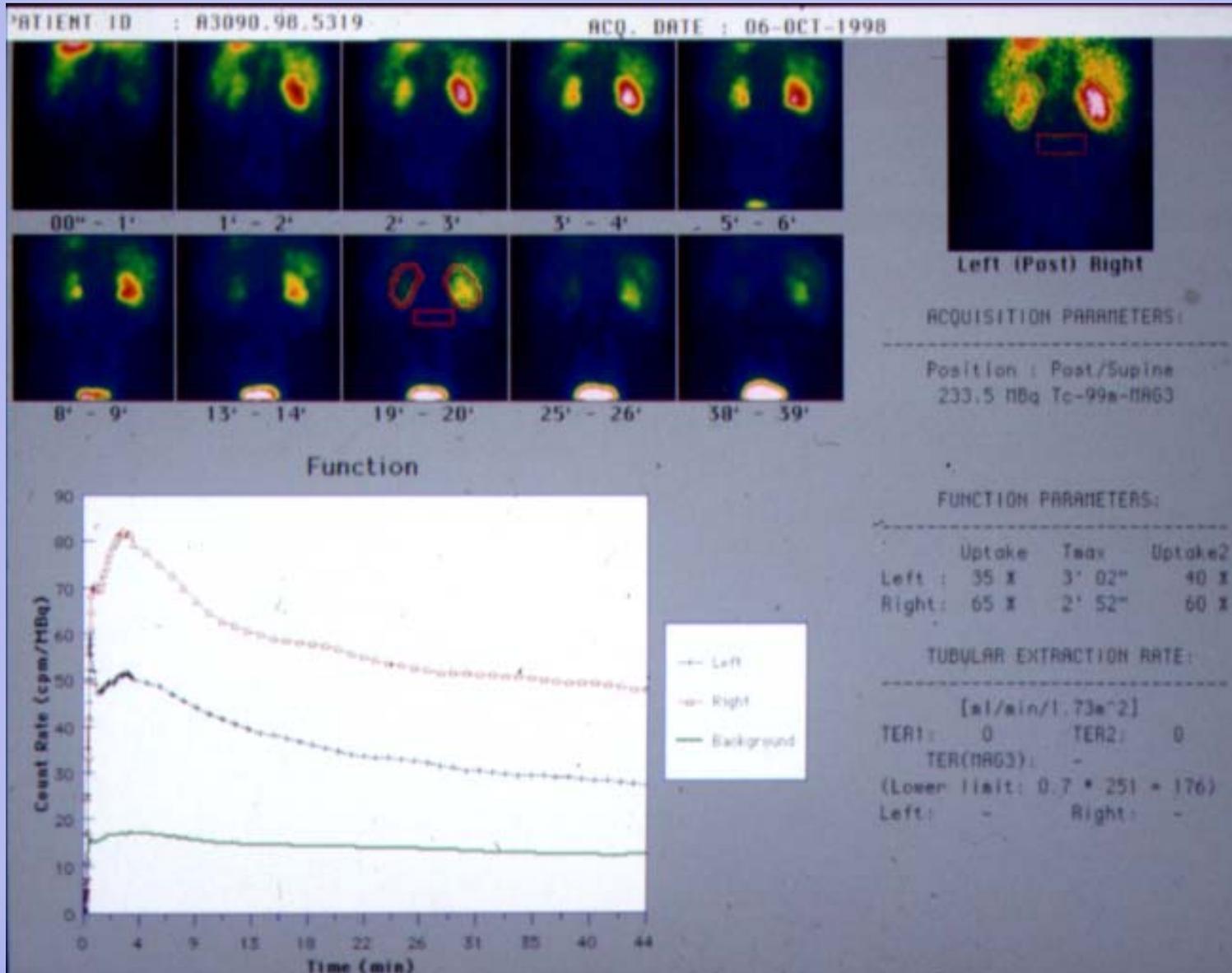


Phasenverschiebung des
Sekretionsmaximums

Phasenverschiebung bei renovaskulärer Hyper- -tonie



Nierenarterienstenose bds. ?



Captopril-Test: NAS rechts

