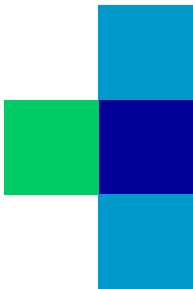


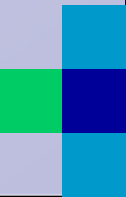
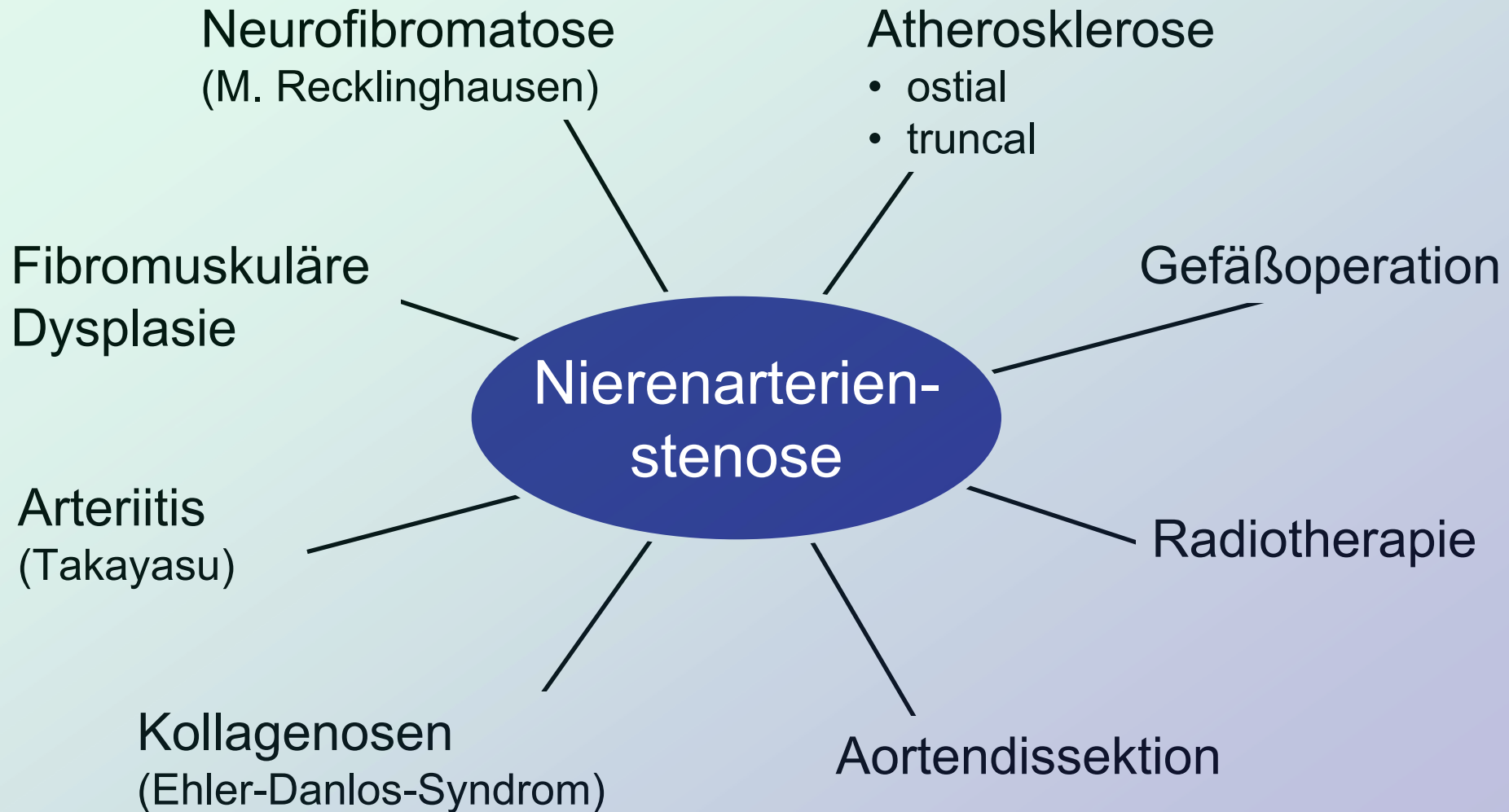
Studienlage zum Nieren-PTA/Stent– welche Evidenz gibt es noch?

Michael Uder

Radiologisches Institut

**Universitätsklinikum
Erlangen**





Fibromuskuläre Dysplasie: PTA



66 Pat.; FU (Median): 32 Mo. (1-121)

technischer Erfolg: 100%

Rezidiv-Stenosen: 10%

Erfolgsrate über 10 J.: 87%



Fibromuskuläre Dysplasie

Study	Year	Patients	Technical				Months of follow-up mean (range)
			Success rate %	Effects on blood pressure			
				Cured	Improved %	Unimproved	
Sos <i>et al.</i> [43]	1983	31	87	59	34	7	16 (4–40)
Baert <i>et al.</i> [44]	1990	22	83	58	21	21	26 (6–72)
Tegtmeyer <i>et al.</i> [45]	1991	66	100	39	59	2	39 (1–121)
Bonelli <i>et al.</i> [46]	1995	105	89	22	63	15	43 (0–168)
Jensen <i>et al.</i> [47]	1995	30	97	39	47	14	12 (NR)
Davidson <i>et al.</i> [48]	1996	23	100	52	22	26	NR
Klow <i>et al.</i> [49]	1998	49	98	26	44	30	9 (1–96)
Birrer <i>et al.</i> [50]	2002	27	100	74 ^c	26	10 (NR)	7.4
Surowiec <i>et al.</i> [51]	2003	14	95	79 ^c	21	NR	28.5
de Fraissinette <i>et al.</i> [52]	2003	70	94	14	74	12	39 (1–204)
Kim <i>et al.</i> [53 [•]]	2008	15	79	13	80	7	24 (1–60)

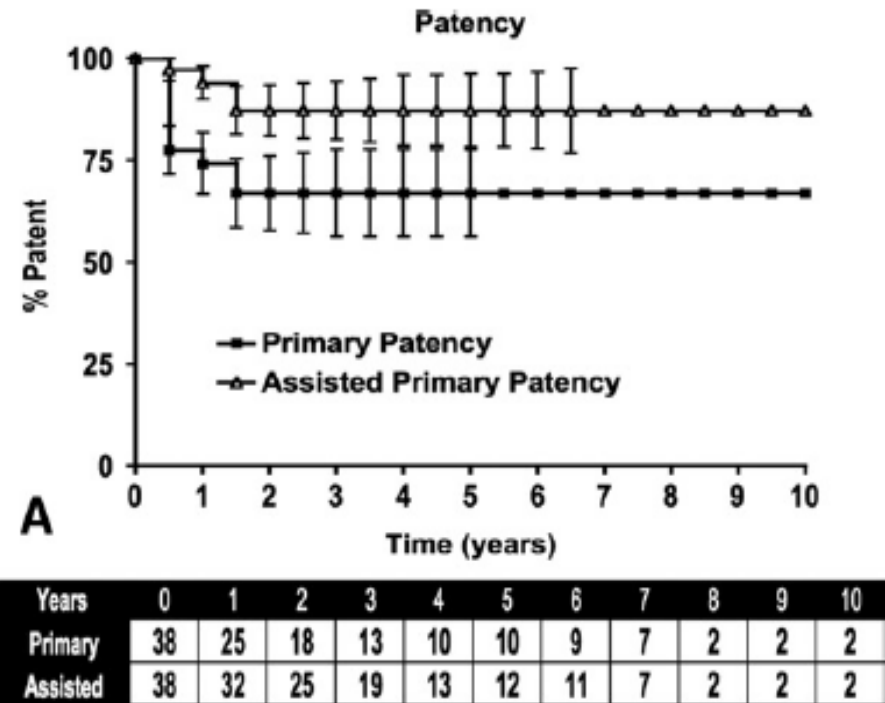
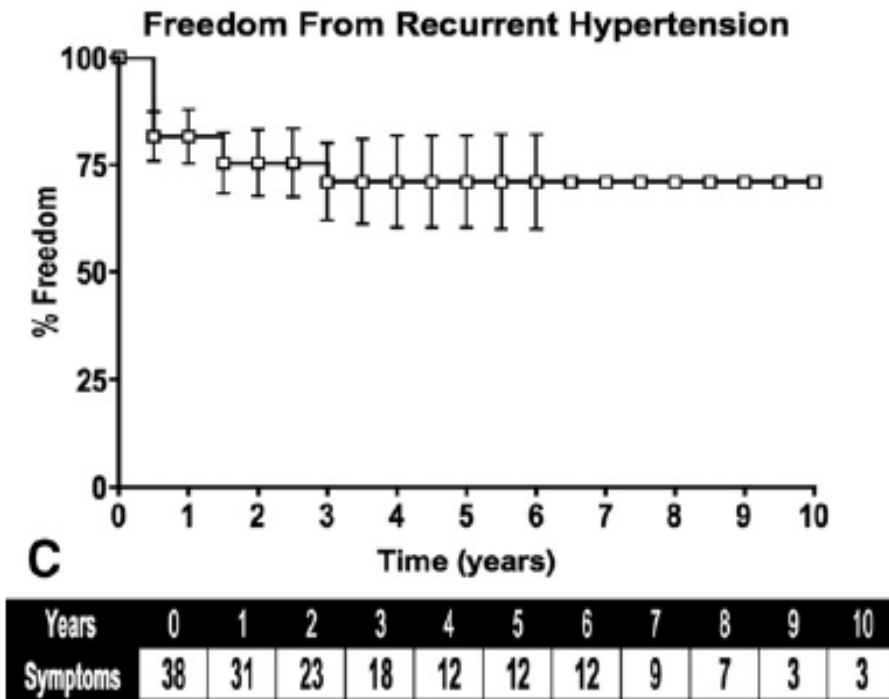
Fibromuskuläre Dysplasie

	Birrer 2002	Surowiec 2003	Alhadad 2005
Patienten	27	14	69
FU (Monate)	10±4 (mean)	24-96	84±57 (mean)
Prim. Offenheit			
1 Jahr	77%	83%	73%
8 Jahre		69%	67%
Stent	1 Pat.	0 Pat.	5 Pat.



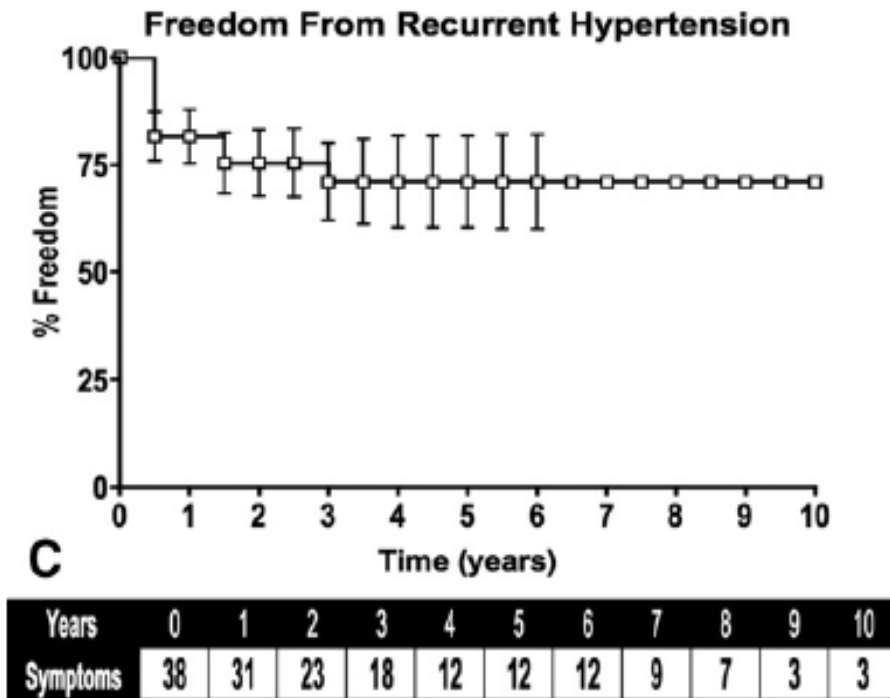
Fibromuskuläre Dysplasie

29 Frauen, 45 Jahre (mean), 38 Intervent.; retrospek., FU (median): 2 J.



Fibromuskuläre Dysplasie

29 Frauen, 45 Jahre (mean), 38 Intervent.; retrospek., FU (median): 2 J.



Outcome Predictoren (RR, 95% CI):

Hypertension < 8 J (1.23; 1-2.98, P=.02),

eGFR > 60 mL/min (26.5; 18.1-34.5, P=.01)

ipsilat. Niere >9 cm (1.41; 1.1-3.3; P=0.03)

Niere contralat. (1.53; 1.1-1.96, P=.04)

Blutgluc. <110 mg/dL (1.53, 1.17-2.3, P=.04)

Triglyc.>150 mg/dL (6.67, 1.9-10, P=.004)

HDL >50 mg/dL (3.89, 2.1-6.4, P=.024)

Alter > 50J **n.s.**

Arteriosklerotische Stenose



Metaanalyse 1322 Pat.; FU 6-29 Mo.

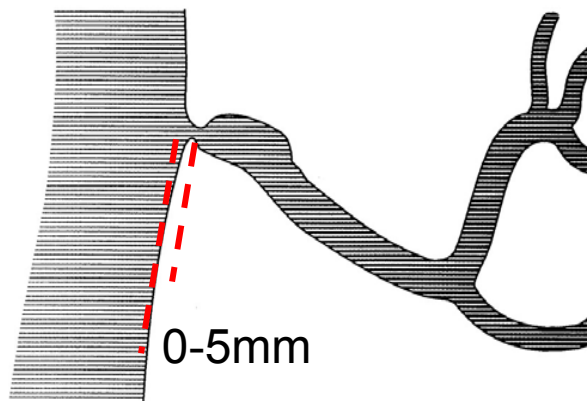
	<i>PTA</i>	<i>Stent</i>
techn. Erfolg:	77%	98%
Restenose:	26%	17%

$P < 0.001$

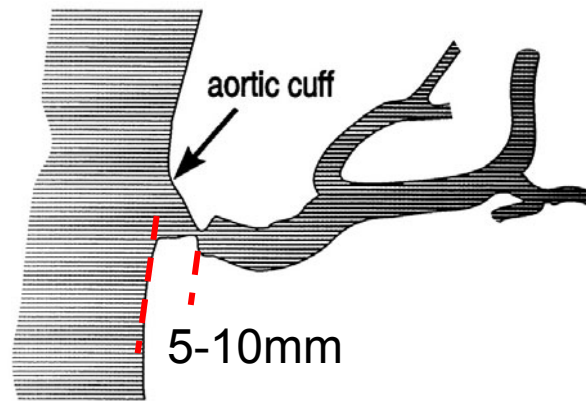


Atherosklerotische Stenosen

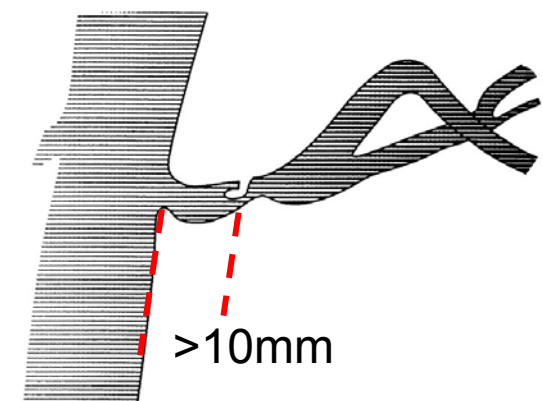
163 Pat. (200 Stenosen); prospektiv; FU (median): 12 Monate



ostial
29%



proximal
50%

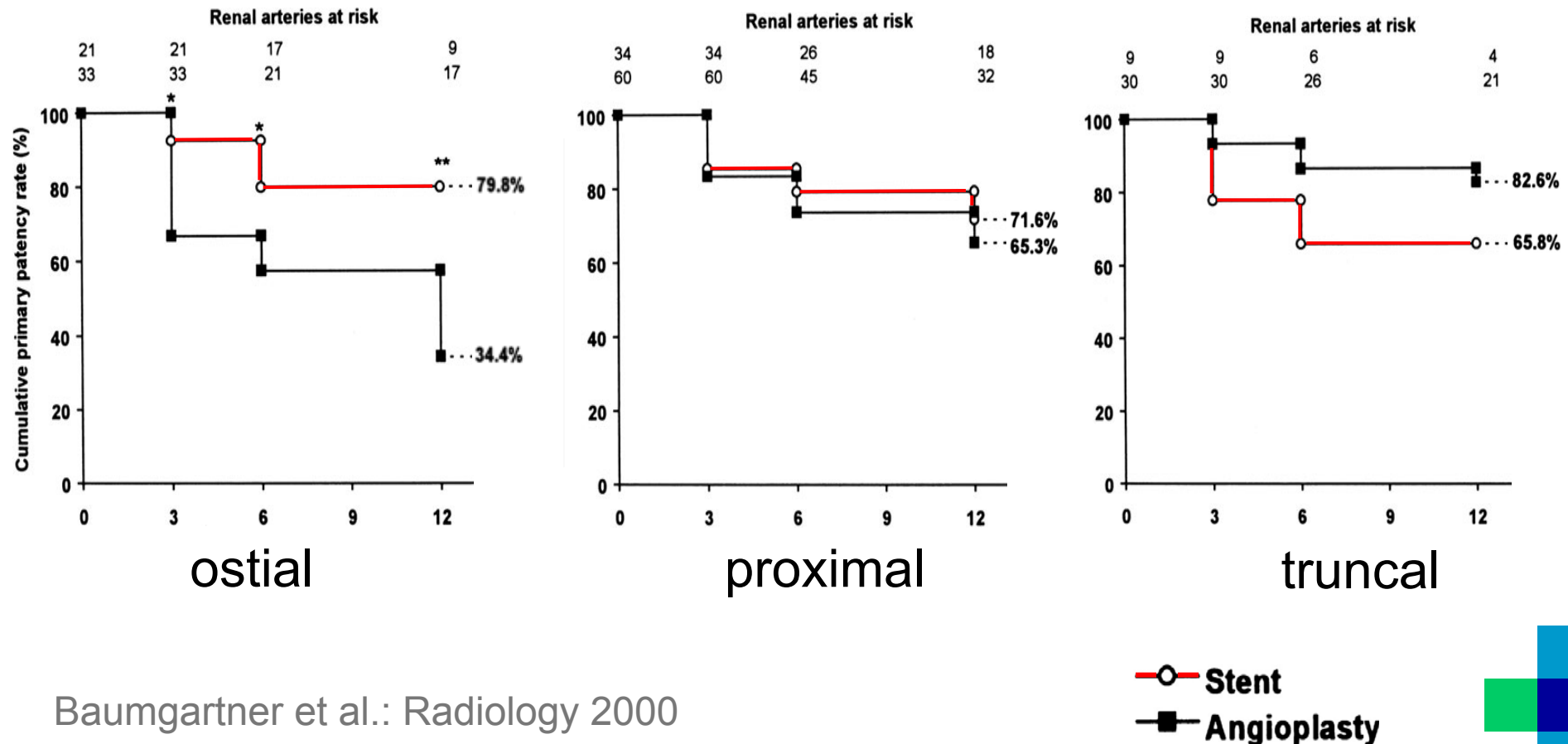


truncal
21%



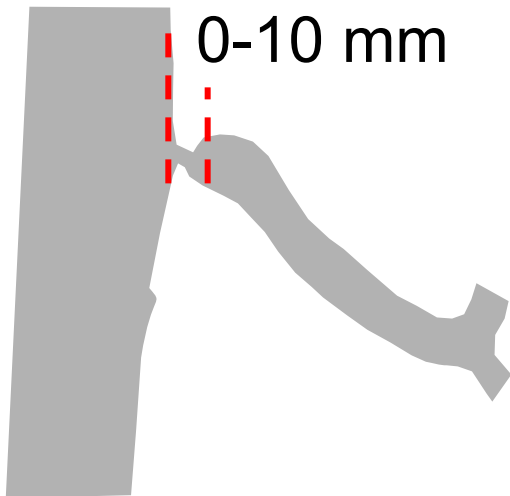
Atherosklerotische Stenosen: PTA vs. Stent

163 Pat. (200 Stenosen); prospektiv; FU (median): 12 Monate



Ostiale Stenose: Stent vs. PTA

85 Pat. (prospektiv, randomisiert); FU: 6 Mo.



	techn. Erfolg	Offenheit	Restenose
PTA	57%	29%	48%
Stent	88%	75%	14%

Kein Unterschied im klinischen Erfolg!



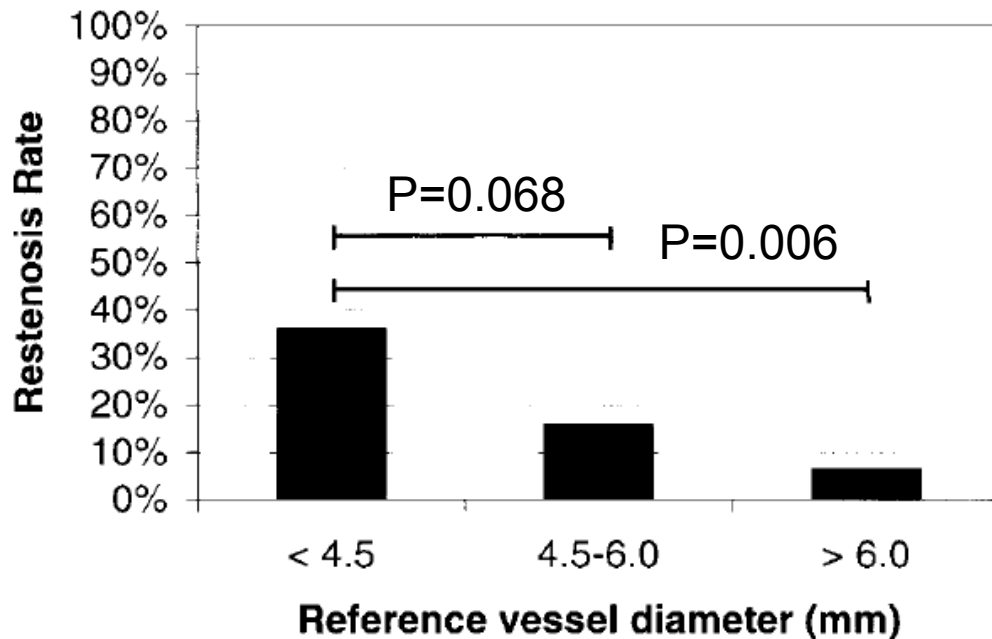
Restenose nach Stenttherapie

Author	No. of patients	Stent type	Technique	Definition of restenosis	Restenosis rate (%)	Follow-up period (months)
Hennequin et al. [34]	21	Wallstent	Angiography	Not defined	20	29 (mean FU)
Van de Ven et al. [29]	24	Palmaz	Angiography	>50%	13	6
Dorros et al. [23]	76	Palmaz	Angiography	>50%	25	6
Ianonne et al. [30]	63	Palmaz	Duplex	≥60%	14	11.3 (mean FU)
Henry et al. [27]	59	Palmaz	Duplex	AT > 70 m/sec, PSV > 1.5 m/sec	9.2	14 (mean FU)
Blum et al. [25]	68	Palmaz	Duplex	PSV > 2.0 m/sec + dRI > 0.05	11	27 (mean FU)
				angiography (>50%)		
Taylor et al. [26]	29	Palmaz	Angiography	≥50%	16	6.7 (mean FU)
White et al. [35]	100	Mixed	Angiography	>50%	19	8.7 (mean FU)
Gross et al. [36]	30	Palmaz, InFlow, Be-Stent	Angiography	Not defined	12.5	6
Van de Ven et al. [24]	42	Palmaz	Angiography	≥50%	14	6
Baumgartner et al. [37]	21	Mixed	Duplex	≥60%	20	12
Watson et al. [38]	33	Palmaz	Duplex	≥60% (RAR >3.5)	18	20 (mean FU)
Beutler et al. [39]	63	Not documented	Angiography	≥50%	30	23 (median FU)
Lederman et al. [33]	300	Mixed	Angiography	≥50%	21	16 (median FU)
Rocha-Singh et al. [40]	51	Palmaz	Duplex	≥60% (PSV >2 m/sec, RAR > 3.5)	14.3	13.1 (mean FU)
				or angiography (≥50%)		
Zeller et al. [31]	215	Mixed	Duplex	≥70% (RAR > 3.5 + dRI > 0.05)	11.2	12
Zeller et al. [32]	156	Mixed	Duplex	≥70% (RAR > 3.5 + dRI > 0.05)	11.4	12
Zeller et al. [41]	143	Palmaz Genesis, Radix	Duplex	≥70% (RAR > 3.5 + dRI > 0.05)	6.4	22 (mean FU)

FU, follow-up; PSV, pvelocity; RAR, renal aortic flow velocity ratio; dRI, side-difference in intrarenal resistance index.

Rezidiv-Stenose nach Stent

300 Pat. (363 Stents), FU: 16 Mo. (Median)



Restenose-Rate nach
10 Monaten (mean)

- 21% (23/102 Pat.)
- 12% bei $\varnothing > 4,5\text{mm}$

Beschichtete Stents

■ Carbon-Beschichtung:

Restenoserate: 6,4% (coated) vs. 5,8% (bare) $P > .05$
(147 Pat. FU: 22±5Mo.)

Zeller et al.: J Endovasc Ther 2005

■ Gold-Beschichtung:

1-Jahres-Offenheit: 69% (coated) vs. 84% (bare) $P < .05$
(126 Pat. FU: 15 Mo.)

Nolan et al.: J Vasc Surg 2005

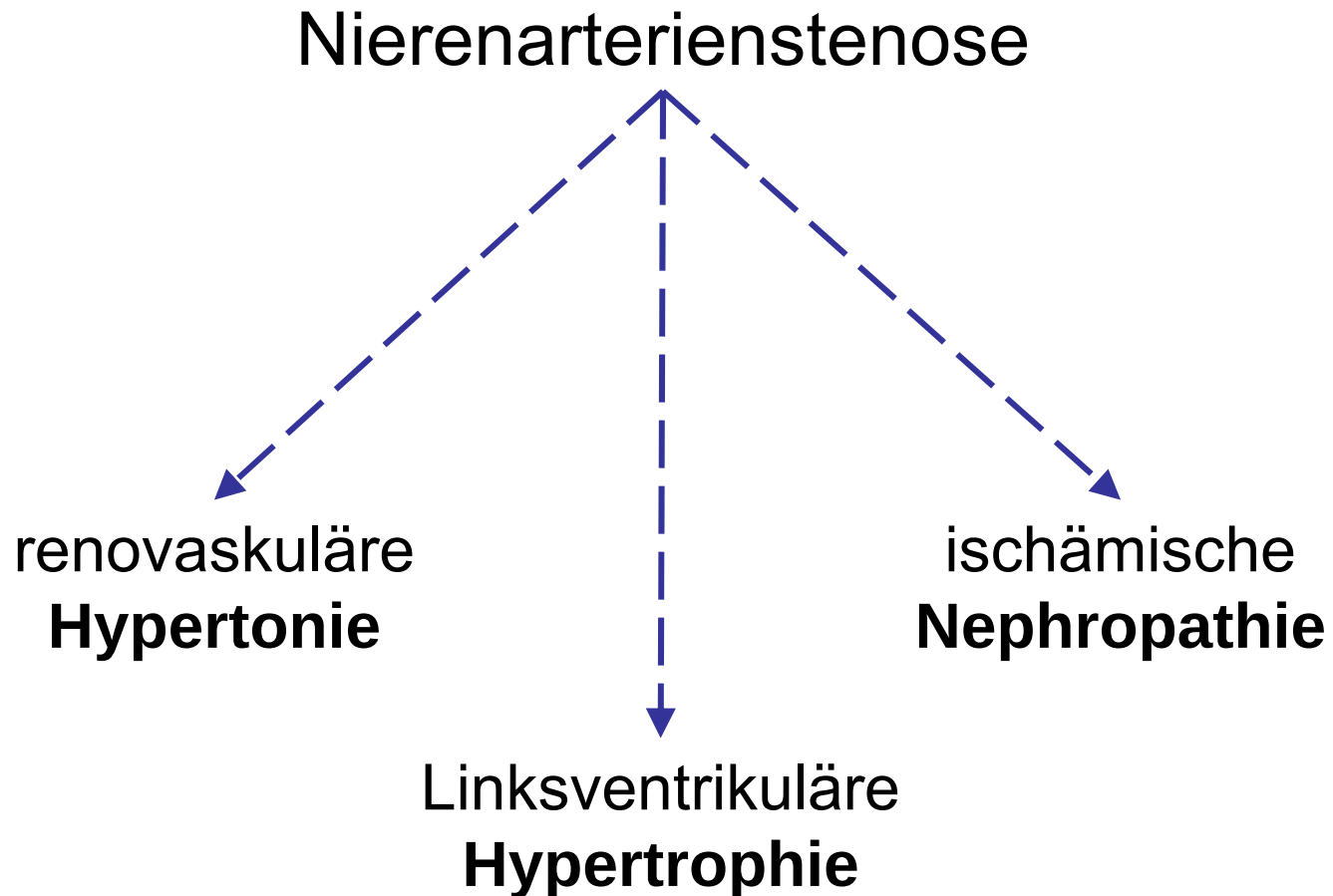
■ Sirolimus Coating

50% Restenose : 19% (coated) vs. 24% (bare) $P > .05$
(105 Pat. FU: 6 Mo.)

Zähringer et al.: J Endovasc Ther 2007

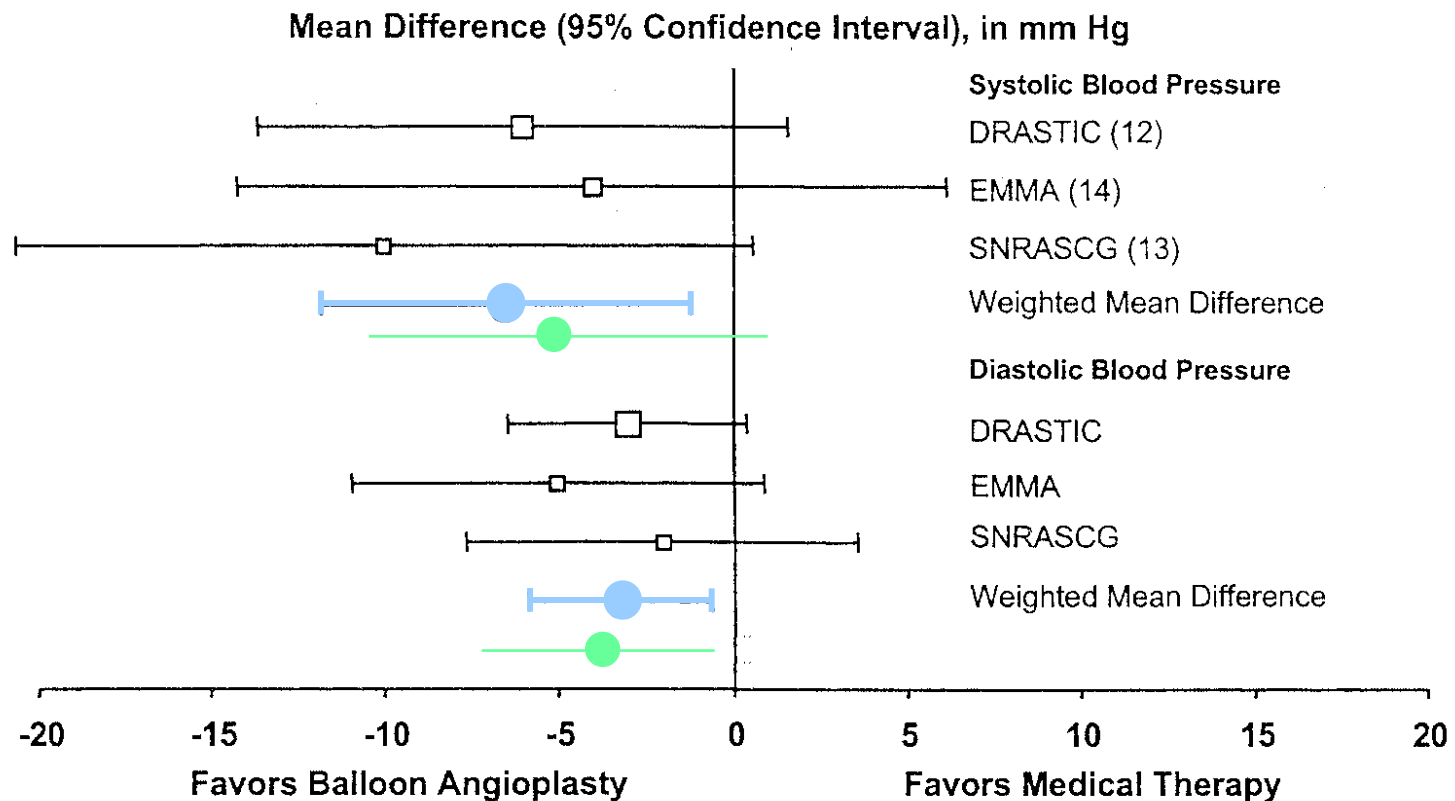
Therapie der Nierenarterienstenose

Ziele

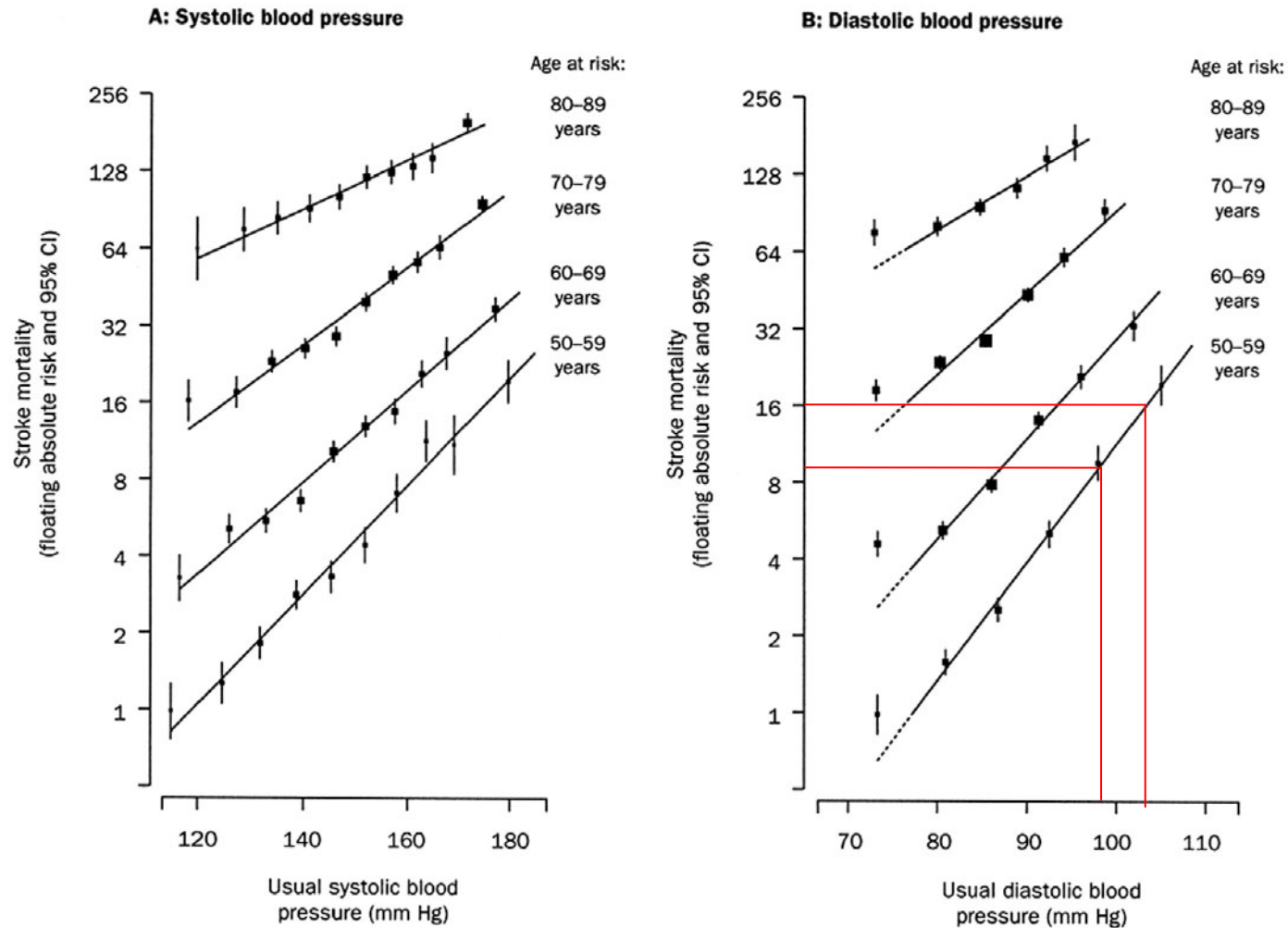


Renale Hypertonie: Angioplastie oder Medikation

Metaanalyse 210 Pat. (3 Studien), FU: 3-12 Mo.

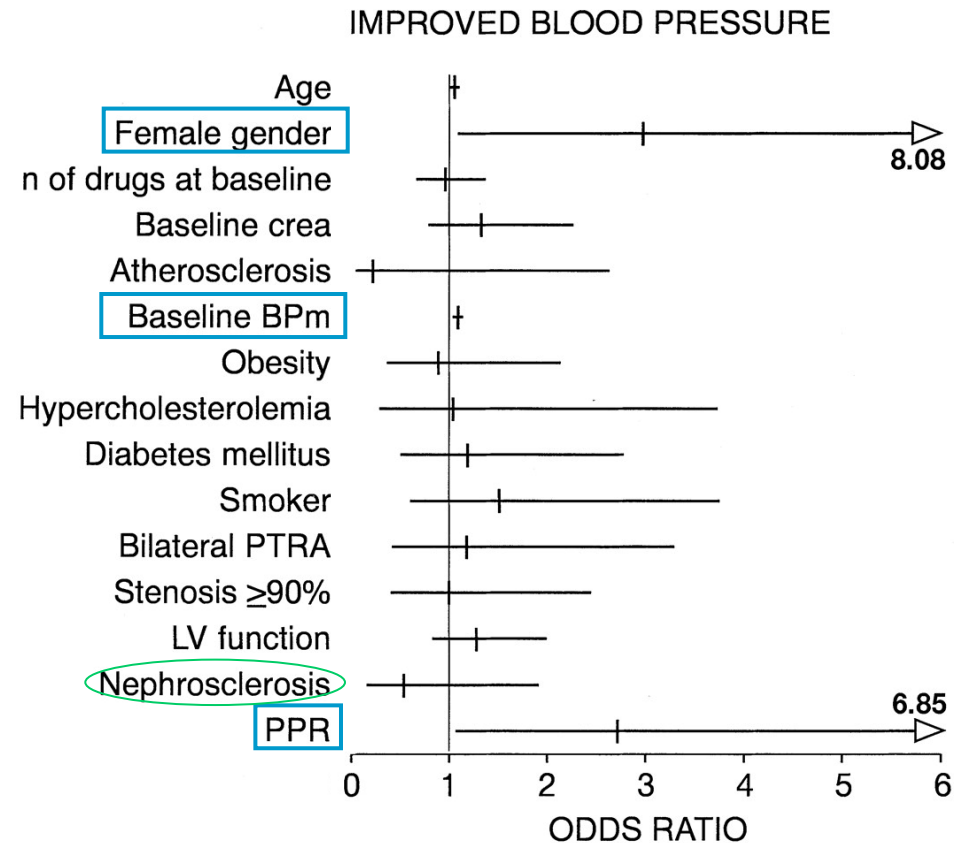
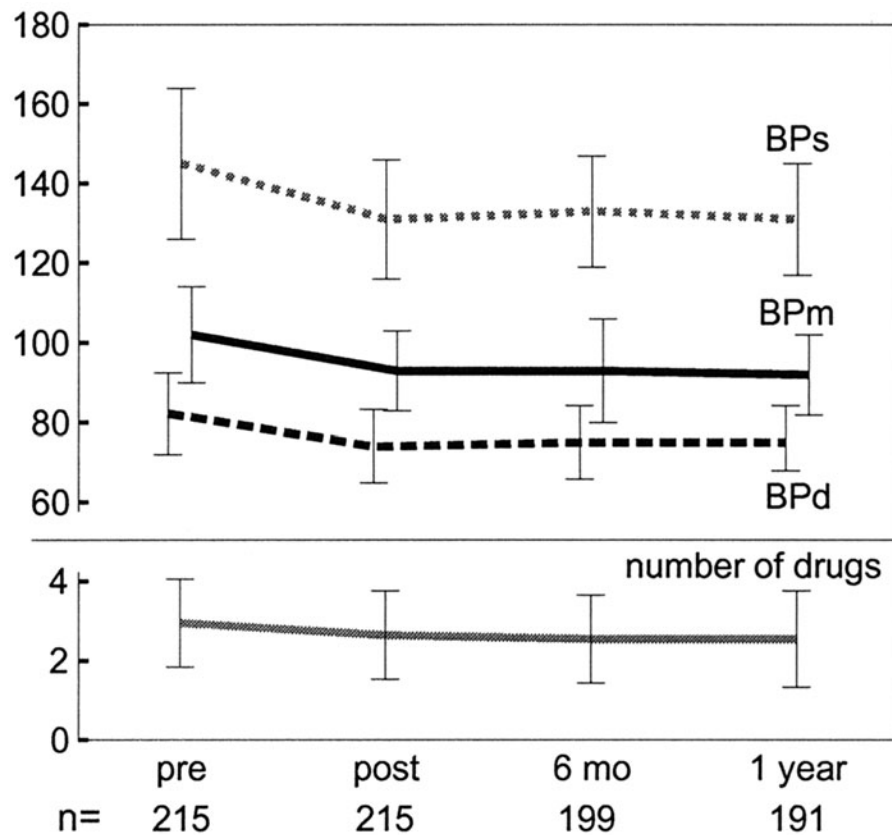


JNC-7 Report: Stroke-Mortalität



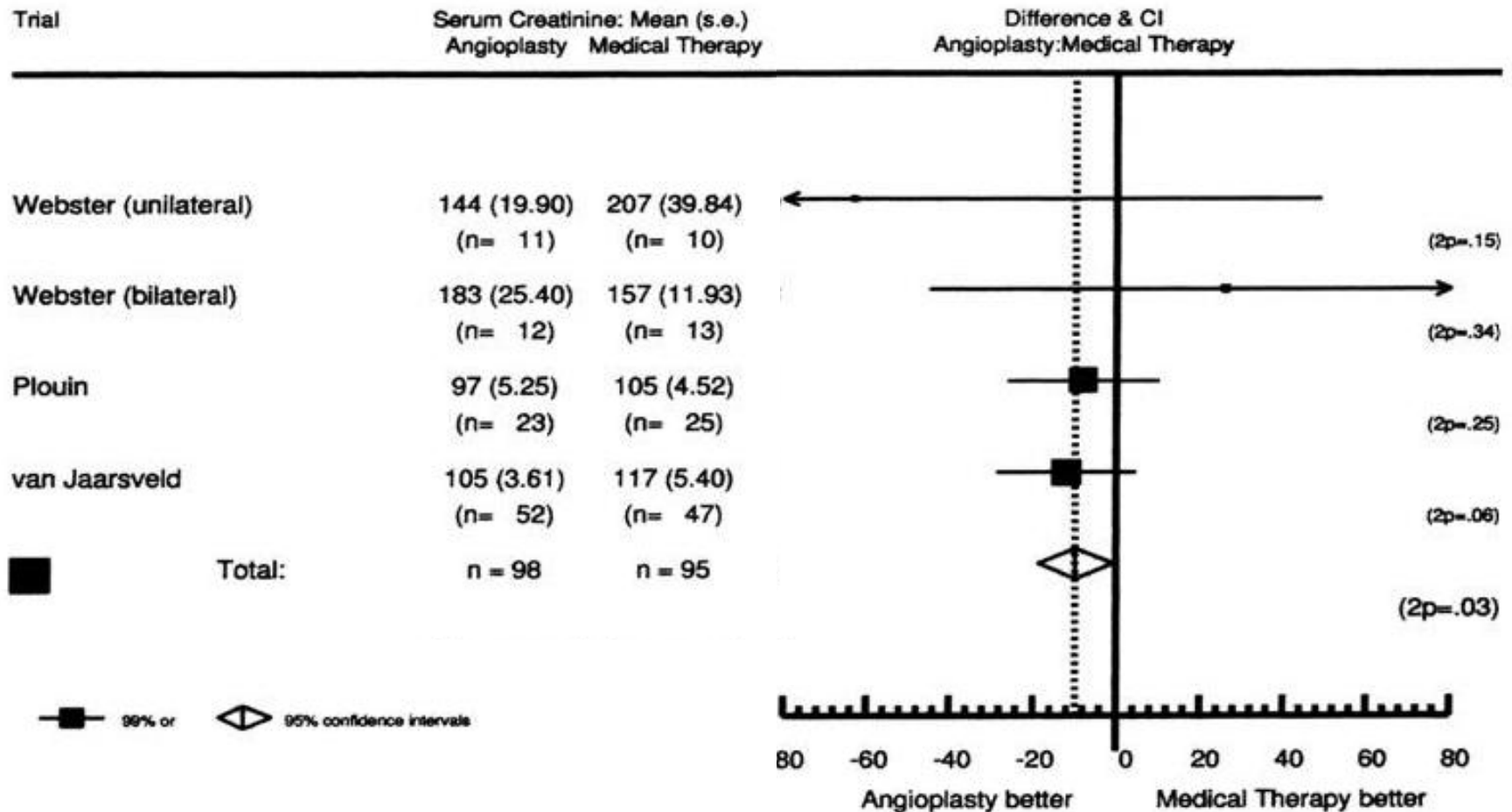
Renale Hypertonie: Prädiktoren für Outcome

251 Pat., 277 ostiale Sten. $\geq 70\%$, Follow-up: 1Jahr



Nierenfunktion: Angioplastie oder Medikation

Metaanalyse 210 Pat. (3 Studien), Follow-up: 3-12 Monate



Stenttherapie bei Niereninsuffizienz

23 Pat.; FU (Median): 17 Mo. vor, 8 Mo. nach Stent

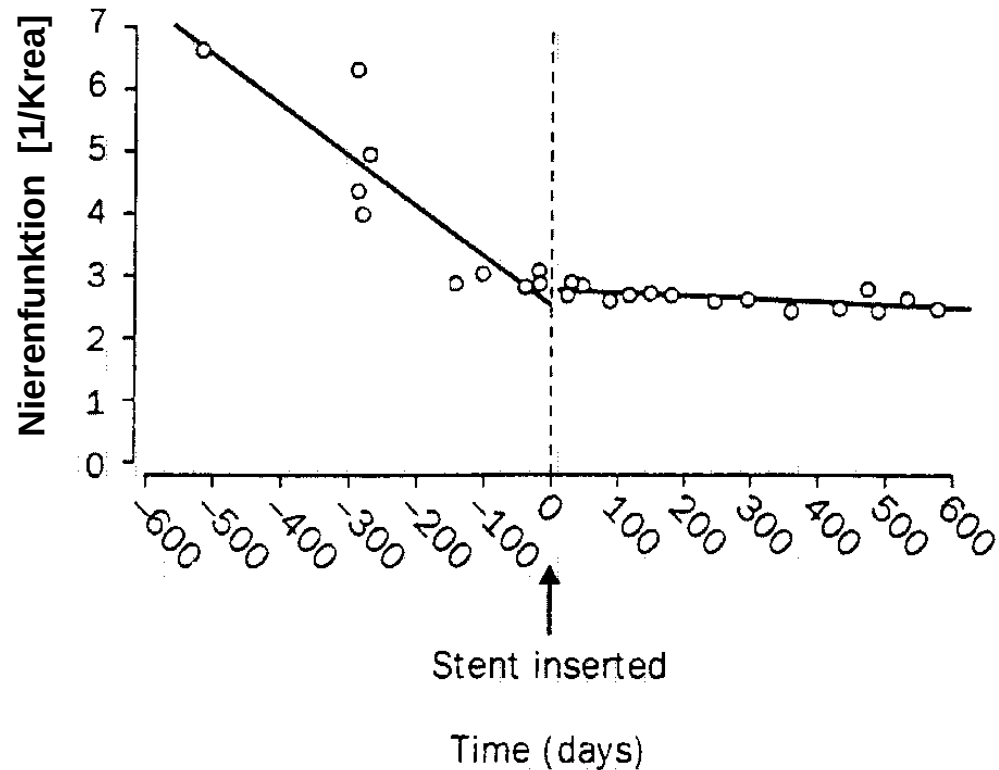
Krea. [mg/dl]: 2,9 (median)

Stenose: > 50%

Progression:

langsamer 78%

schneller 22%



Harden et al.: Lancet 349, 1997

Niereninsuffizienz

Verlangsamung/Beschleunigung der Progression

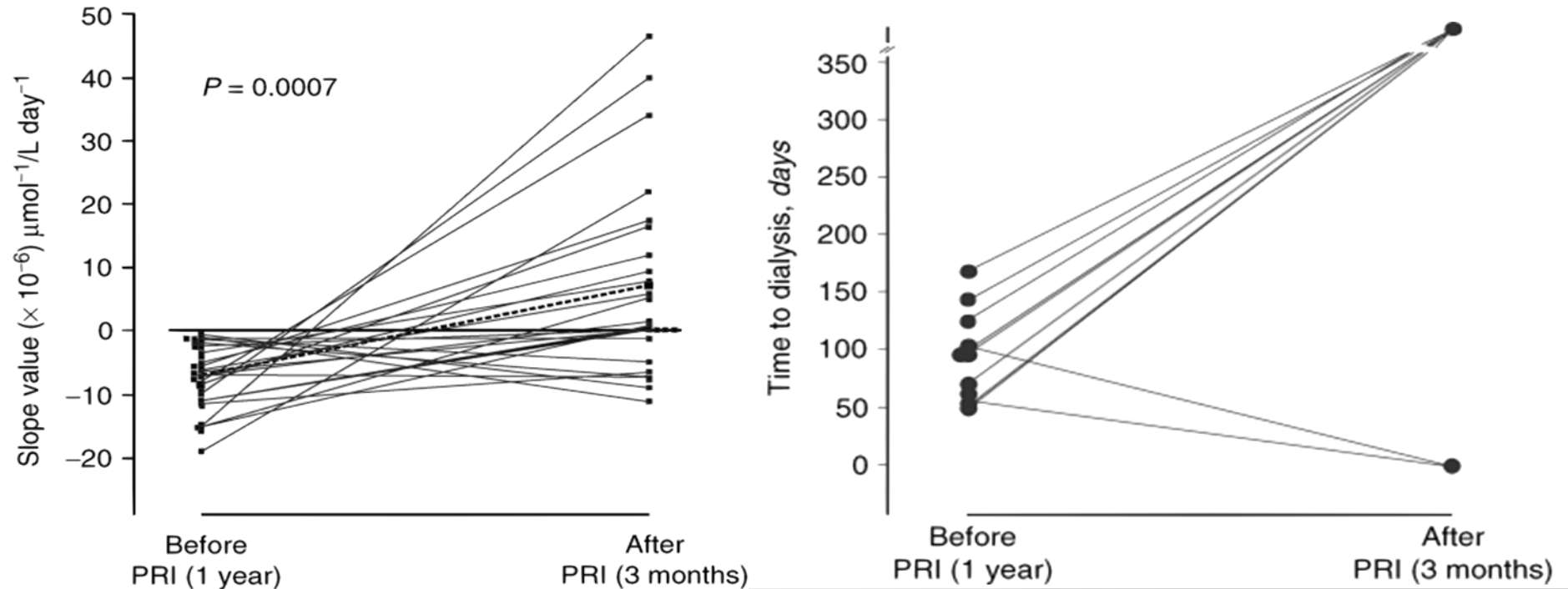
	Harden (1997)	Watson (2000)	Korsakas (2004)	Rivolta (2006)
Patienten:	23	25	17 (28*)	52
Krea. [mg/dl]:	2,9 (median)	1,5-4	5,4 (mean)	2.9 (mean)
Stenose:	> 50%	> 70%, global	>80% unilat. >60% bilat.	>70%
Progression:				
langsamer	78%	100%	76% (53%*)	75%
schneller	22%		18% (36%*)	25%

* 11 Pat. dialysepflichtig vor Intervention



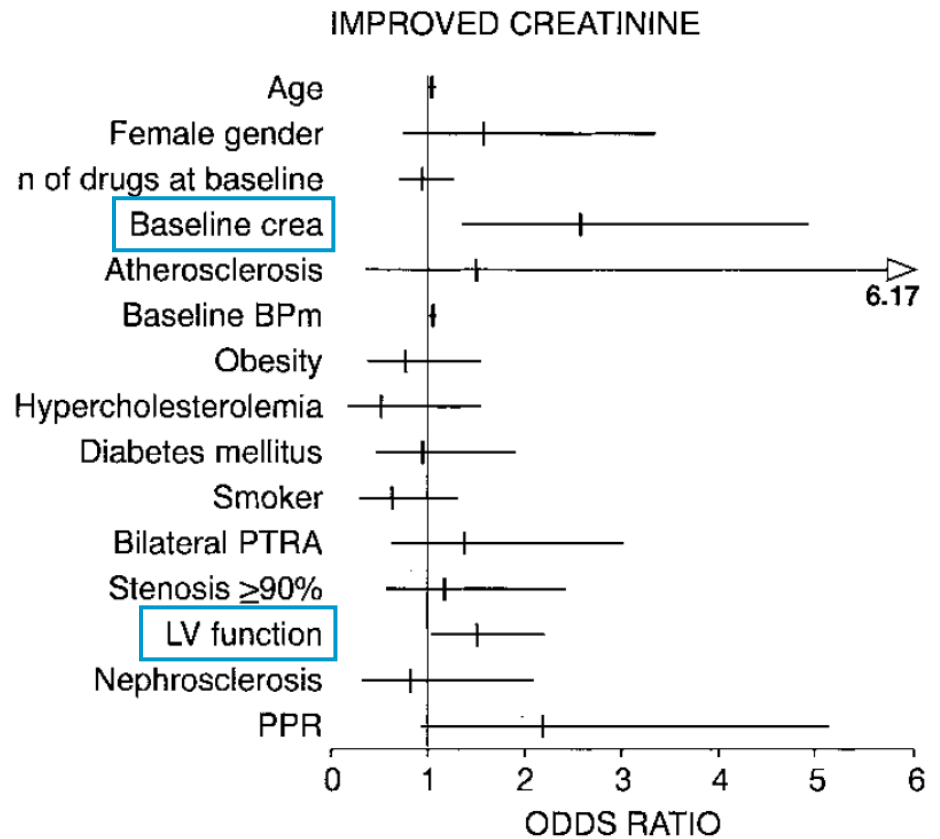
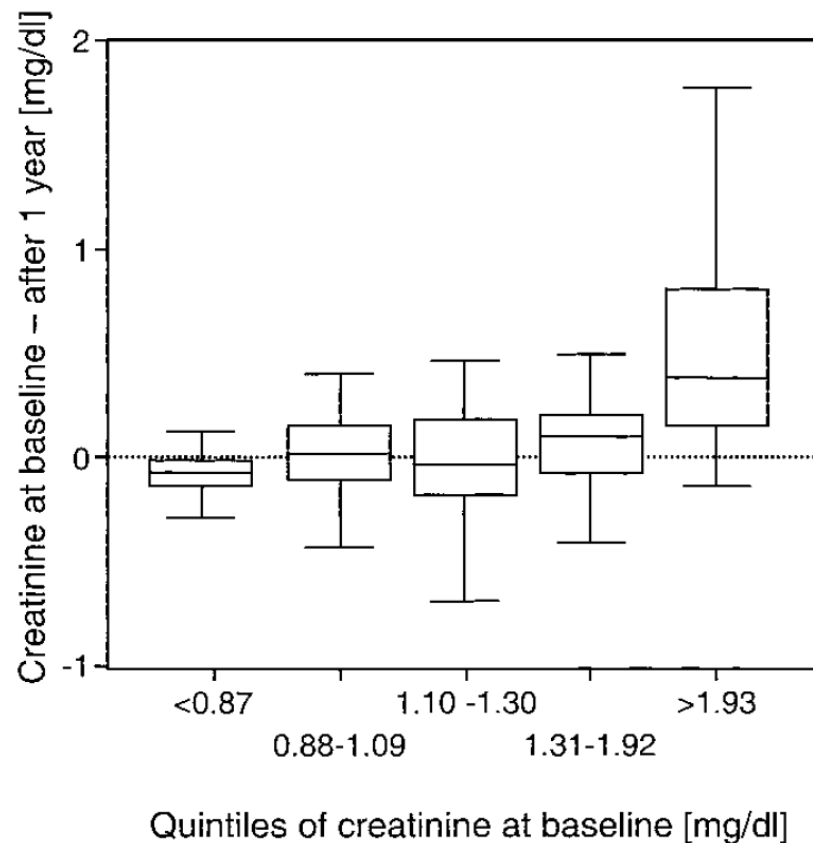
Verlangsamung der Progression und Verzögerung der Dialyse

28 Pat. (53 Intervent.), prospektiv, FU: 12 Monate

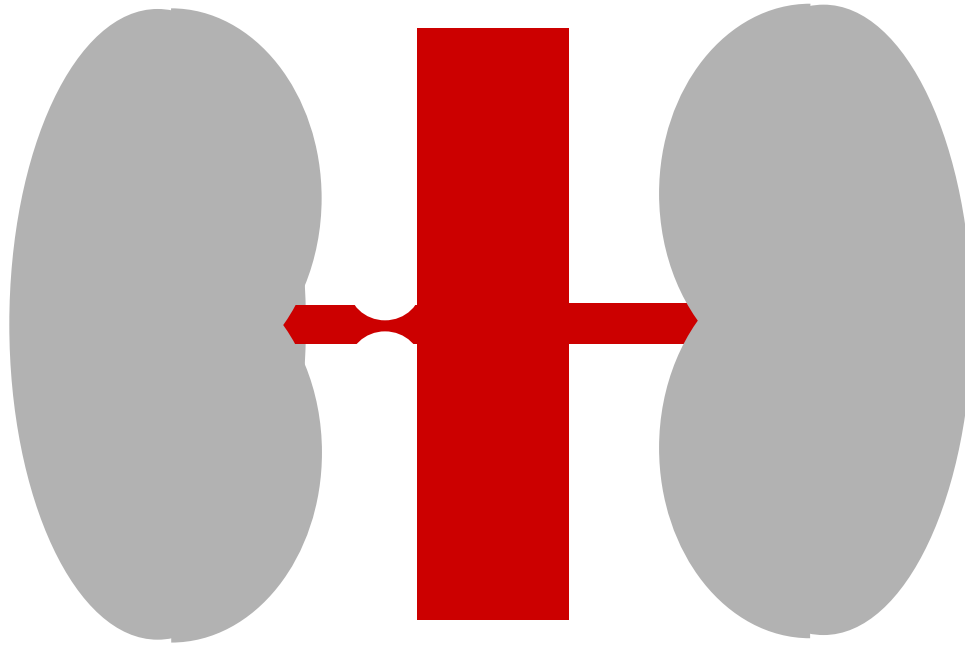


Nierenfunktion nach Stent

251 Pat., 277 ostiale Sten. $\geq 70\%$, Follow-up: 1Jahr



Niereninsuffizienz



unilateral, >50%

S-Kreatinin erhöht
Stabil seit mind. 1 Jahr



Randomisierte Studien

- **STAR:** Nierenfunktion (140 Pat.)
- **ASTRAL:** Progression d. Nierendysfunkt. (806 Pat.)
- **CORAL:** Renal Adverse Events (1000 Pat. geplant)
- **RAVE:** Progression zu terminaler NI; Tod (240 Pat. geplant)
- **NITTER:** Progression zu terminaler NI; Tod



Randomisierte Studien

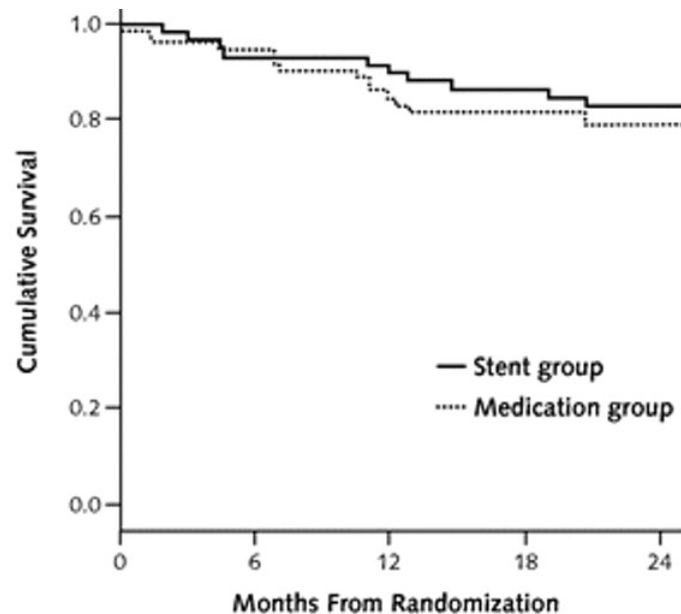
- **STAR:** Nierenfunktion (140 Pat.)
- **ASTRAL:** Progression d. Nierendysfunkt. (806 Pat.)
- **CORAL:** Renal Adverse Events (1000 Pat. geplant)
- **RAVE:** Progression zu terminaler NI; Tod (240 Pat. geplant)
- **NITTER:** Progression zu terminaler NI; Tod



STAR: Abnahme der eGFR $\geq 20\%$

140 Pat.(64 Medikation, 74 Med. + Stent), NAST $\geq 50\%$, Follow-up: 2J.

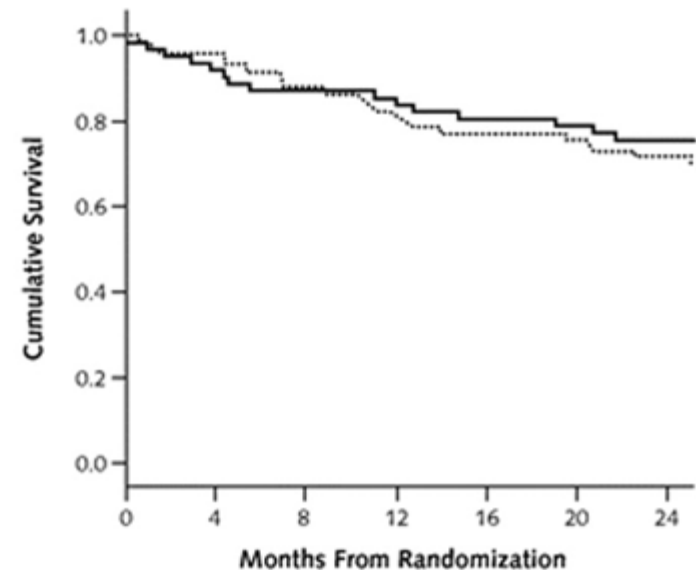
Abnahme eGFR



Patients remaining, *n*

Medication group	76	68	60	57	53
Stent group	64	54	52	50	46

Abnahme eGFR + Tod



Patients remaining, *n*

Medication group	76	68	60	57	53
Stent group	64	54	52	50	46

STAR: Primäre und Sekundäre Endpunkte

End Point	Stent Group (n = 62)*	Medication Group (n = 74)*	Crude Hazard Ratio (95% CI)†
Primary end point, n (%)‡			
Unilateral or bilateral stenosis	10 (16)	16 (22)	0.73 (0.33–1.61)
Unilateral stenosis only	3 (9)	8 (20)	0.48 (0.13–1.81)
Bilateral stenosis only	7 (22)	8 (23)	0.95 (0.34–2.61)
Secondary end points, n (%)			
Therapy-refractory hypertension	0	3 (4)	–
Malignant hypertension	0	0	–
Pulmonary edema	0	1 (1)	–
Cardiovascular morbidity			
Heart failure	1 (2)	3 (4)	0.39 (0.04–3.71)
Coronary artery disease	3 (5)	3 (4)	1.16 (0.23–5.73)
Peripheral arterial disease	4 (6)	7 (9)	0.67 (0.20–2.28)
Cerebrovascular disease	0	1 (1)	–
Abdominal aortic aneurysm	0	0	–
All-cause mortality			
Overall deaths	5 (8)	6 (8)	0.99 (0.30–3.24)
Cardiovascular mortality	2 (3)	4 (5)	0.59 (0.11–3.25)
Periprocedural mortality§	2 (3)	0	–
Primary end point or death, n (%)	15 (24)	22 (30)	0.81 (0.42–1.56)

STAR: Limitationen

- Überschätzung der Stenosen in MRA und CTA

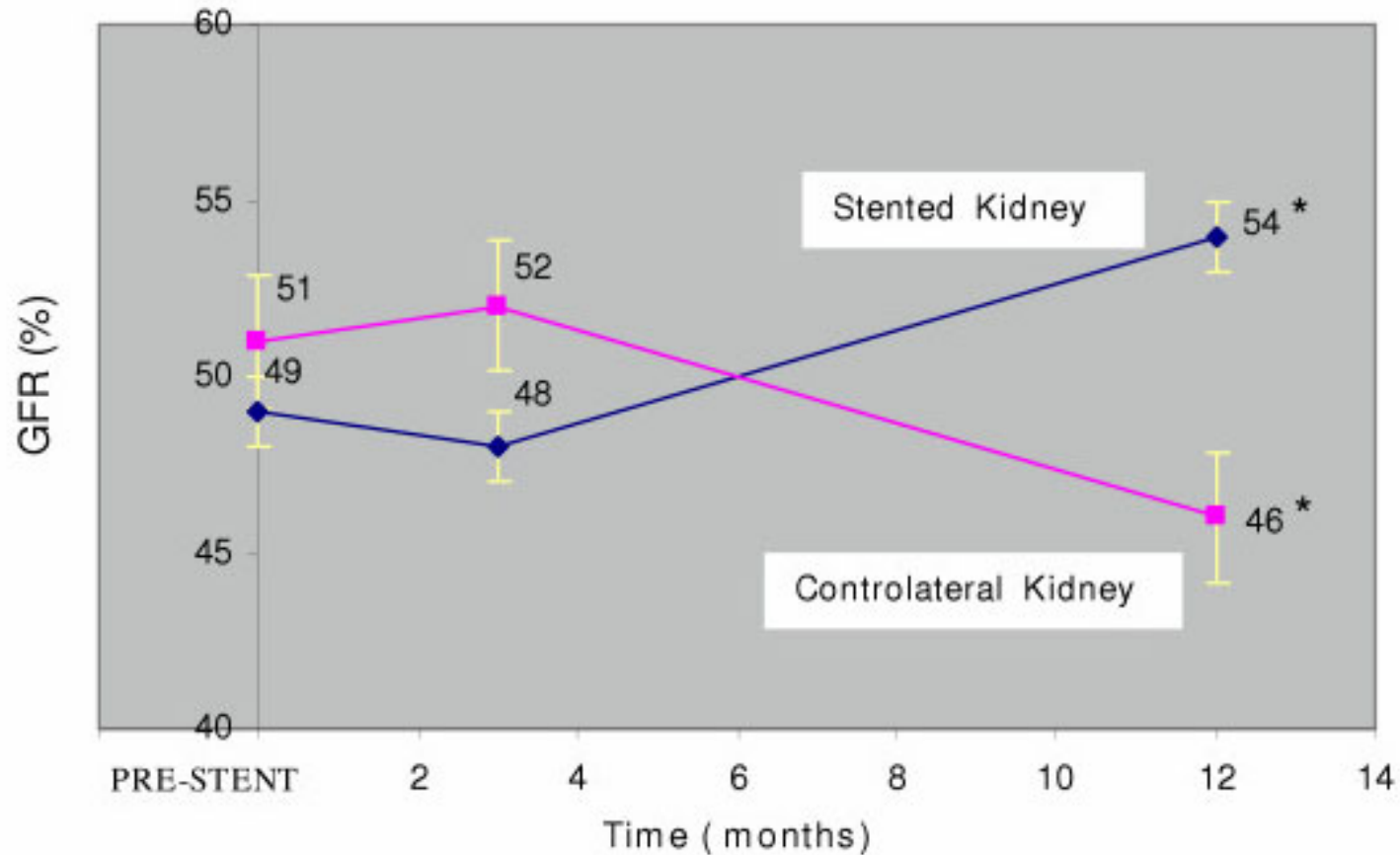
	Stent	Medikation
DSA:	17%	9%
Stenose < 50%	18%	?

- Einschränkung der Nierenfunktion anstelle Progressionsgeschwindigkeit
- Surrogat Parameter (eGFR) als Endpunkt
- mean S-Krea: 1.6 mg/dl, eGFR 45 ml/min/1.73m²



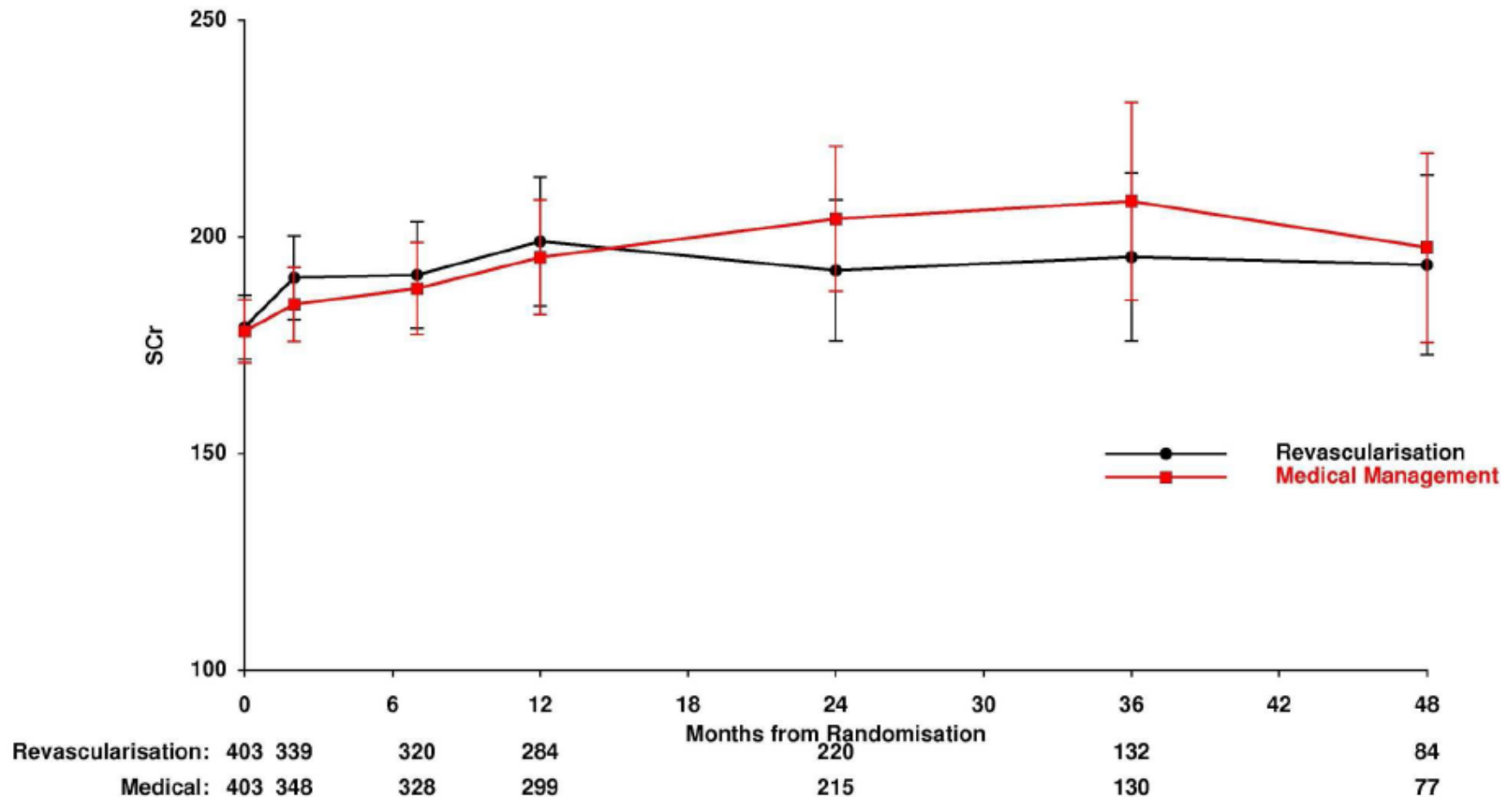
Individuelle GFR nach Stenttherapie

27 Pat. (prospektiv), FU: 12 Mo.



ASTRAL: Serum-Creatinin

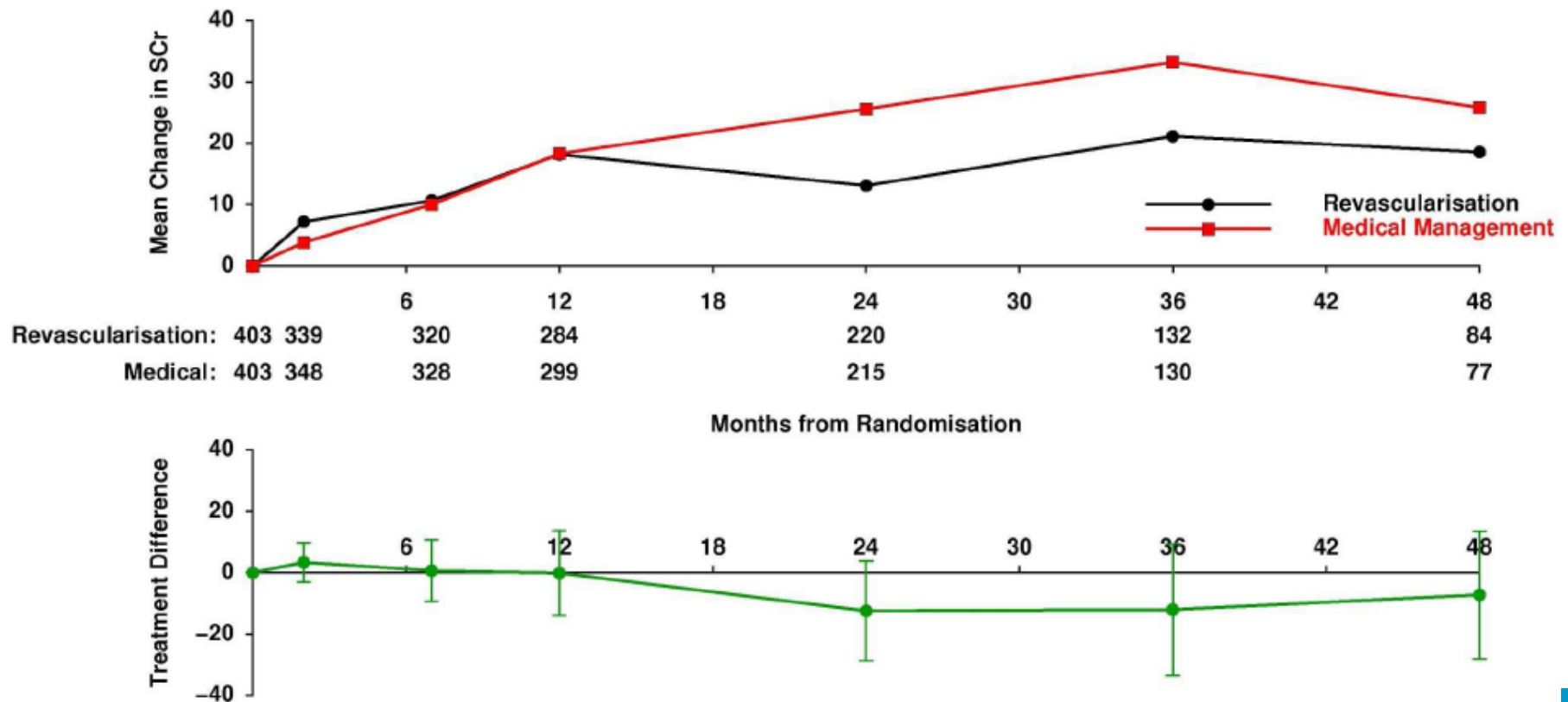
806 Pat.(58 Zentren), NAST ≥ 50 %, Follow-up (mean): 27Mo.



Moss: presented at CIRSE 2008

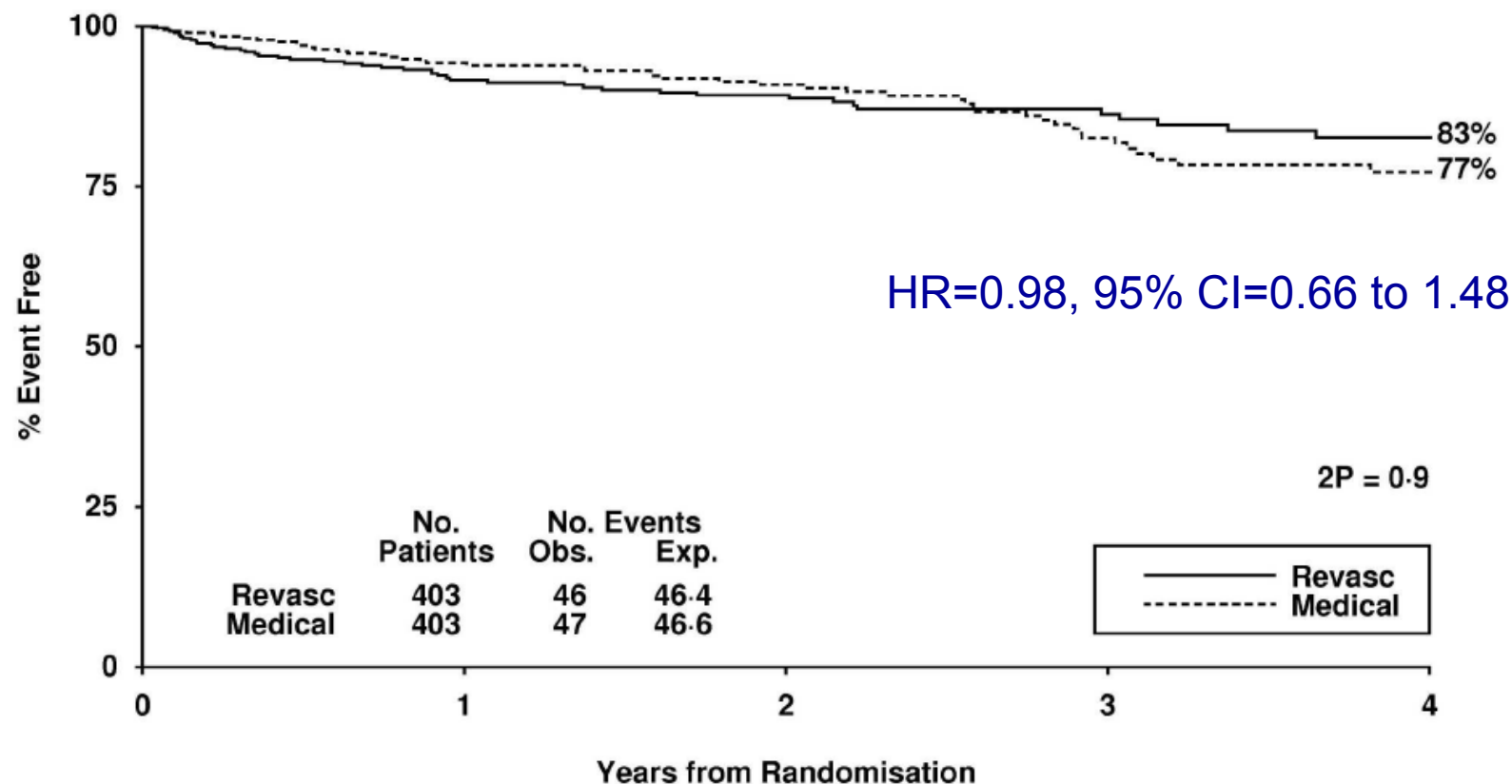
ASTRAL: Änderung im Serum-Creatinin

806 Pat.(58 Zentren), NAST ≥ 50 %, Follow-up (mean): 27Mo.



ASTRAL: Time to first renal event

ARF, dialysis, transplant, nephrectomy, renal death



At risk:

Revasc	403	265	177	111	63
Medical	403	273	182	109	61

ASTRAL: Subgruppenanalyse

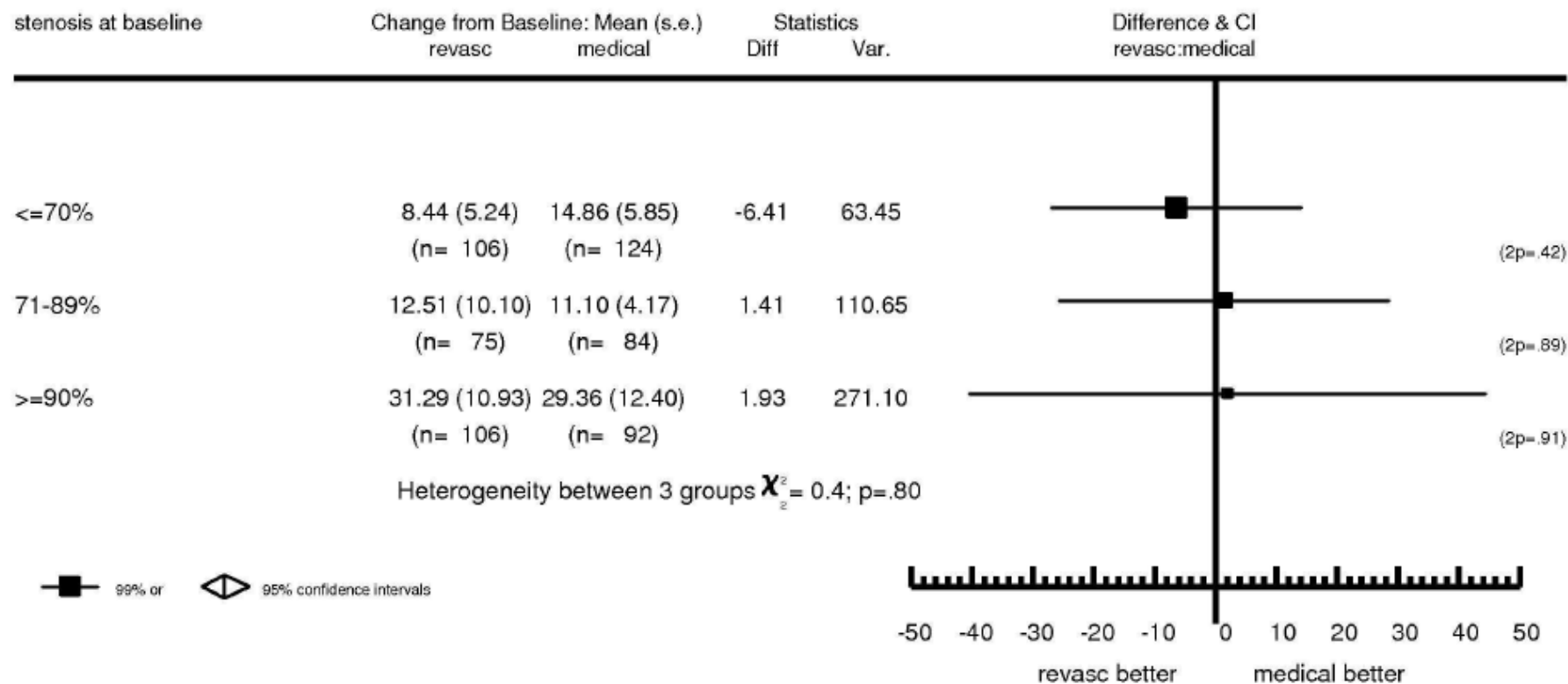
Ergebnis nicht beeinflusst durch

- Höhe des Serum-Kreatinins
- Bilateraler Stenose
- Nierengröße
- Einzelniere
- Stenosegrad
- Progression der Nierenerkrankung



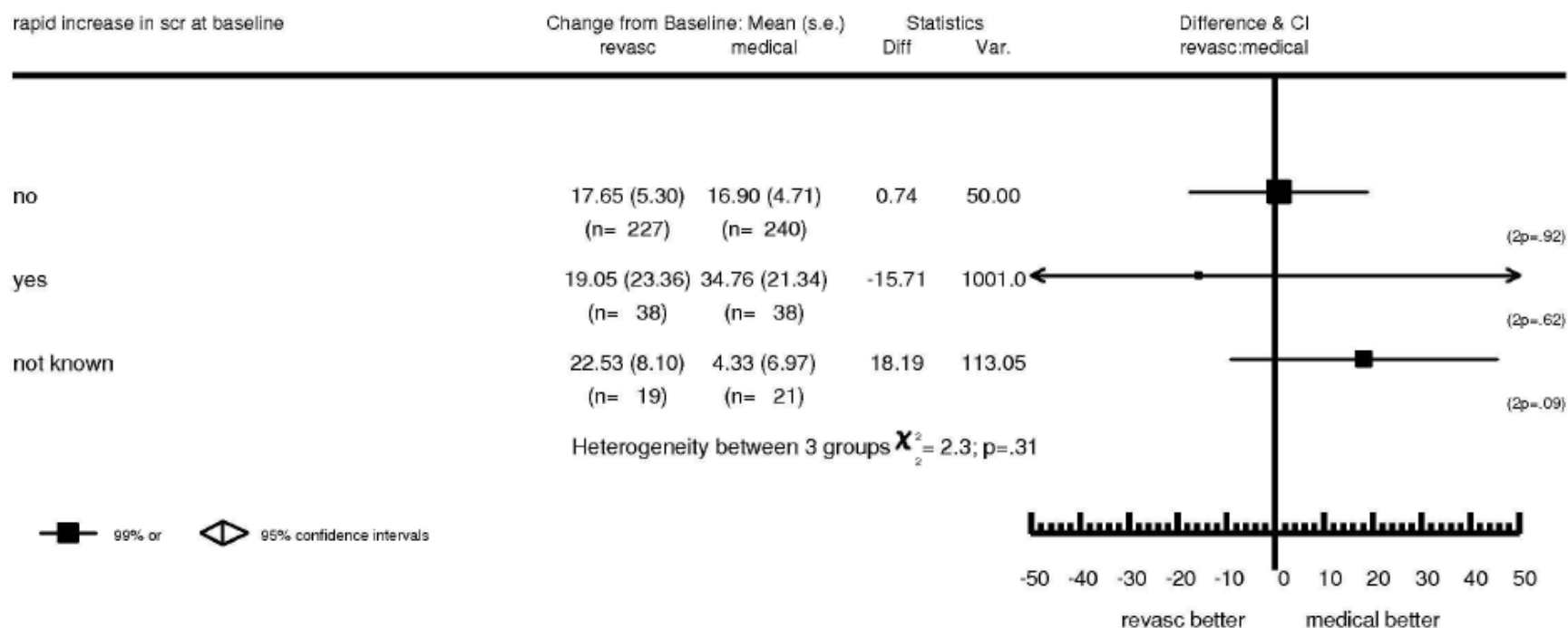
ASTRAL: Subgruppenanalyse (Stenosegrad)

806 Pat.(58 Zentren), NAST ≥ 50 %, Follow-up (mean): 27Mo.



ASTRAL: Subgruppenanalyse (Progression)

806 Pat.(58 Zentren), NAST ≥ 50 %, Follow-up (mean): 27Mo.



ASTRAL: Komplikationen

<24h:

24 (7%) Pat.

- Stentmisplacement 11 (3,3%)
- Renal arterial dissection 4 (1%)
- Thrombose 1 (0.3%)
- Embolisation 6 (1,9%)
- Balloon rupture 1 (0.3%)

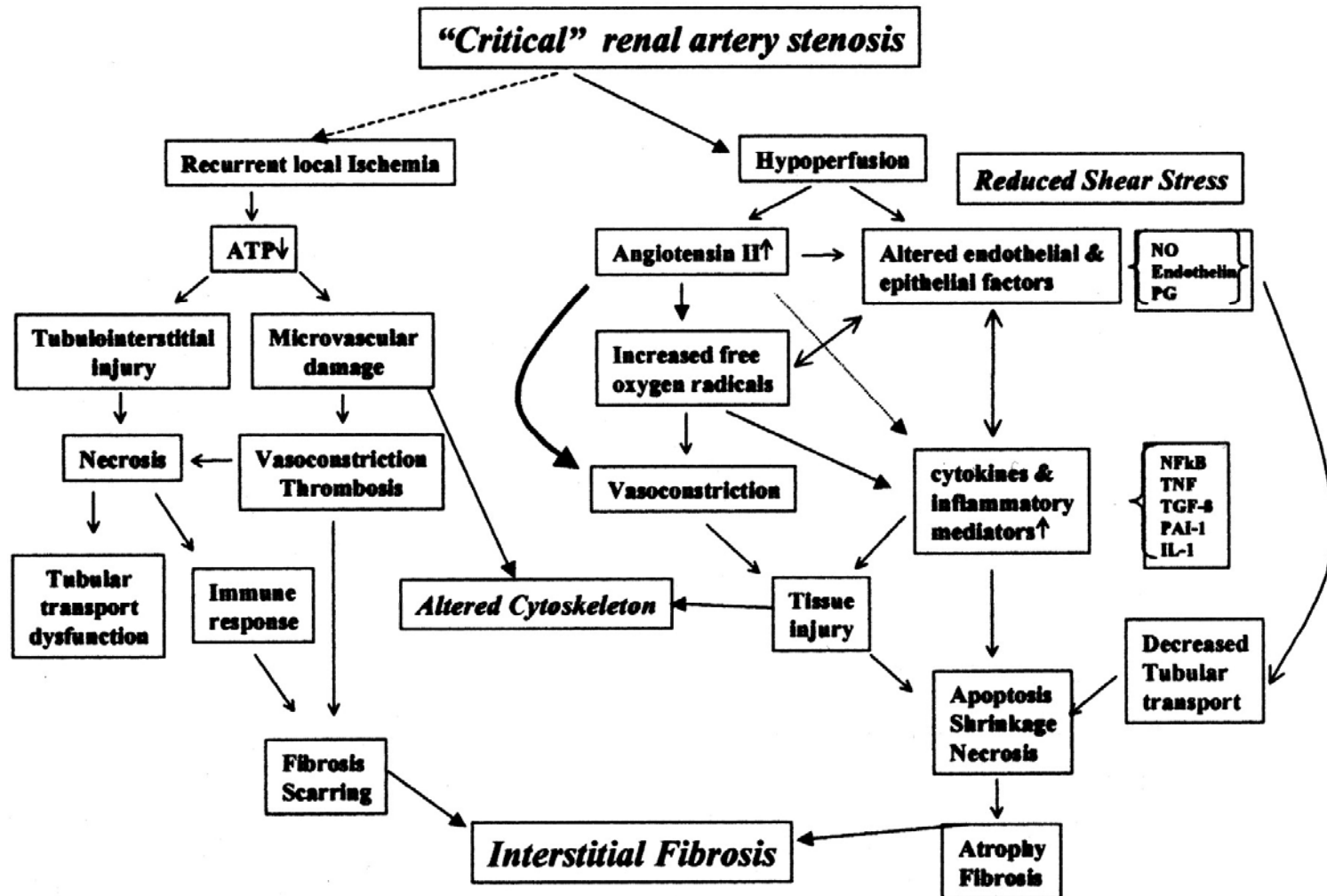
>24h:

44 (17%) Pat.

- Lokale Infektion an der Punktion 1 (0.4%)
- Leistenhämatom 25 (10%)
- Pseudoaneurysma 2 (0.8%)
- Abnahme der Nierenfunktion 26 (10%)

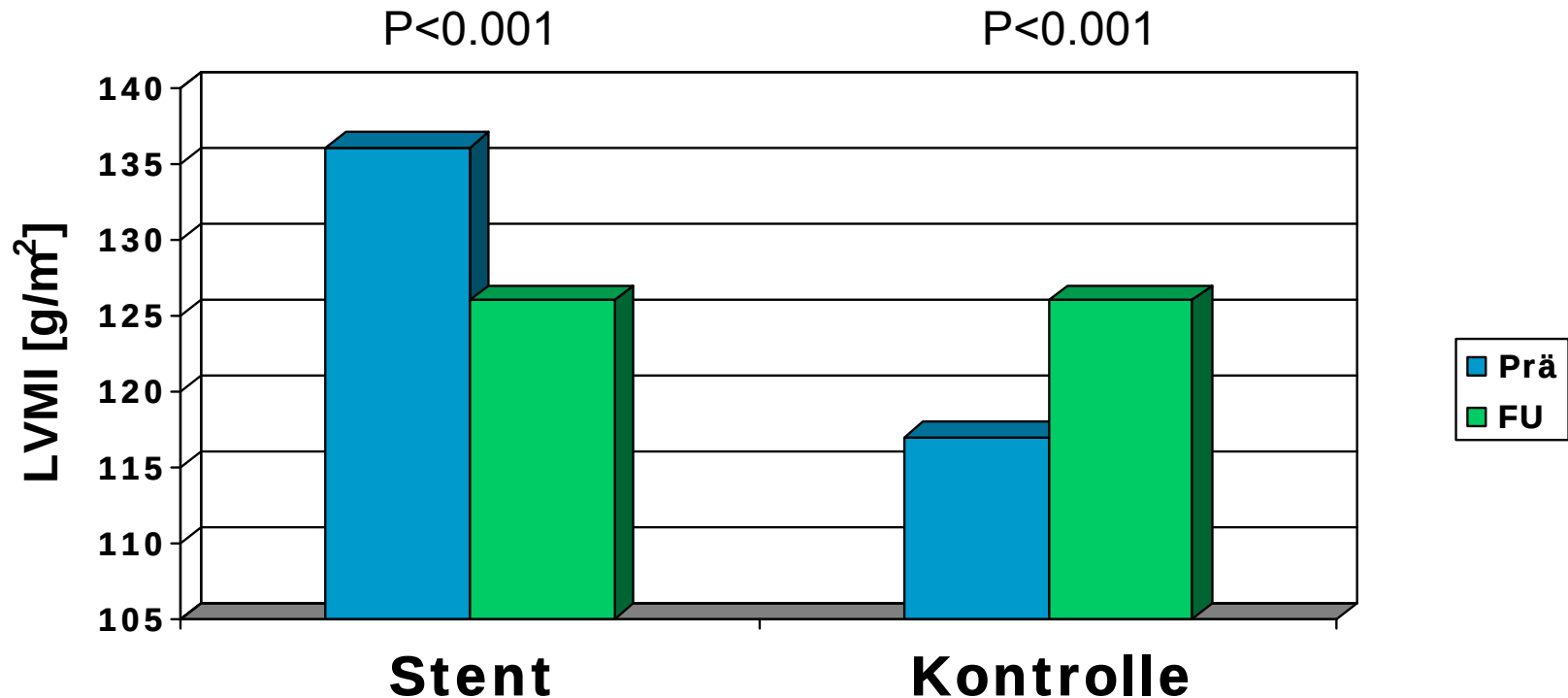


Ischämische Nephropathie



Rückgang der linksventrikulären Hypertrophie

102 Pat. (Stent), 101 Pat. (Kontrolle) Follow-up: 24±14 (6-60) Mo.



Zusammenfassung

■ FMD

- Therapie bei typischen Veränderungen
- PTA (ggf. mehrfach)
- Rezidiv bei 10-30% der Patienten
- Stent vermeiden
- Cutting-Balloon experimentell



Zusammenfassung

■ Atherosklerose

- PTA bei trunkaler Stenose
- Stent bei ostialer Stenose
- Stentdurchmesser korreliert mit Re-Stenose
- Stent-Coating ohne positiven Effekt



Klinische Ergebnisse

■ Renale Hypertonie

- PTA/Stent besser als ihr Ruf
- Aber noch Fragen bei der Stratifizierung der Patienten

■ Ischämische Nephropatie

- Für das Gros der Patienten kein Effekt bewiesen
- Erfolge bei progressivem Funktionsverlust
- Hohes Kreatinin ist keine Kontraindikation
- auf weitere Entscheidungsparameter achten

■ Linksventrikuläre Hypertrophie

- Regression nach Intervention

