7. Balgrist Symposium zum Diabetischen Fuss

Wunden und Ulcera

Angiologische Evaluation und Behandlungsmöglichkeiten

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ZENTRUM FÜR GEFÄSSKRANKHEITEN
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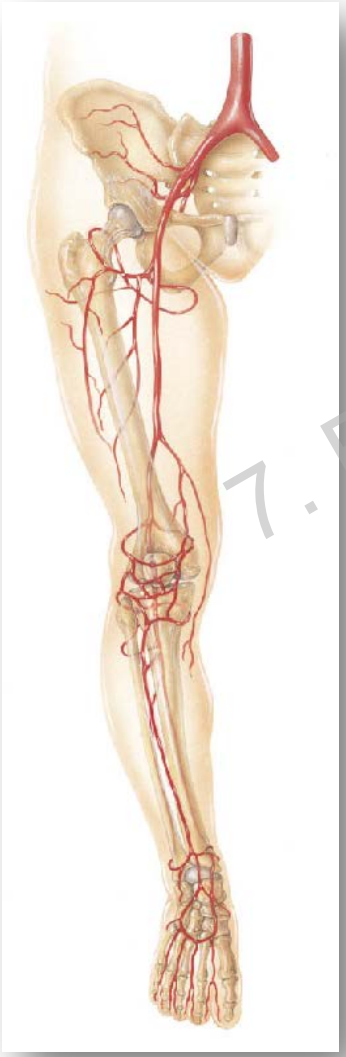
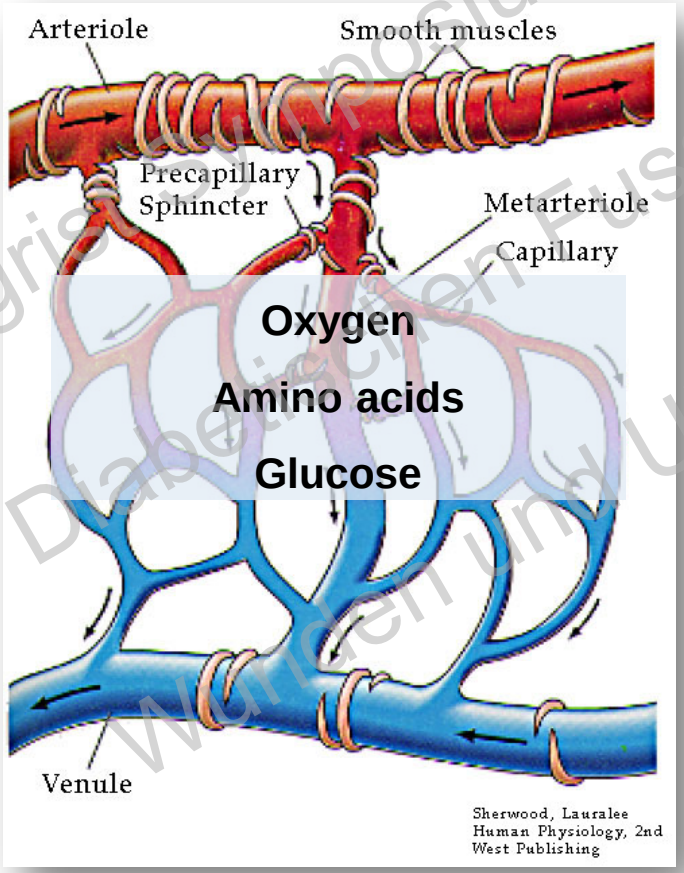
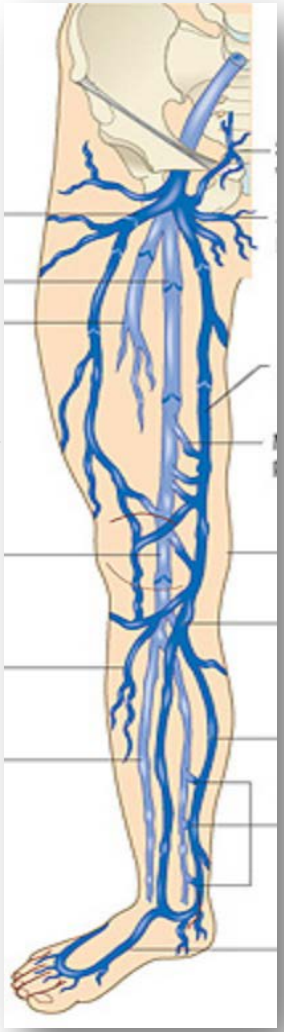
Makro- und Mikrozirkulation

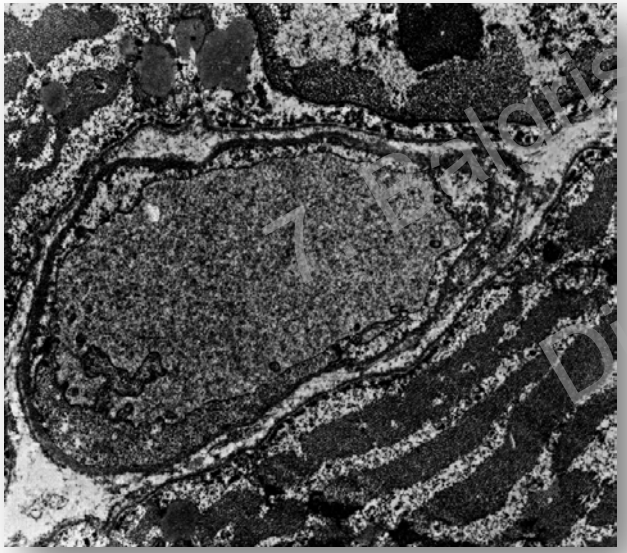






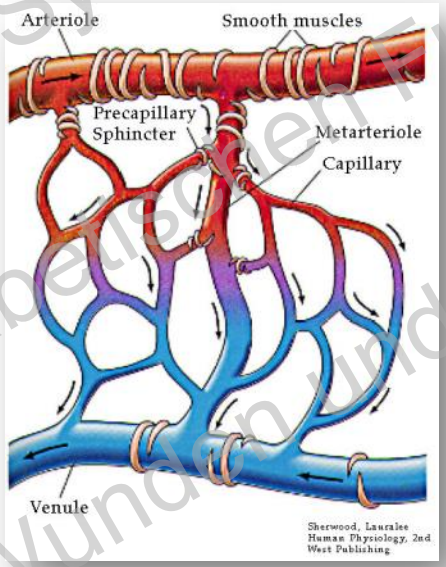
Mikroangiopathie

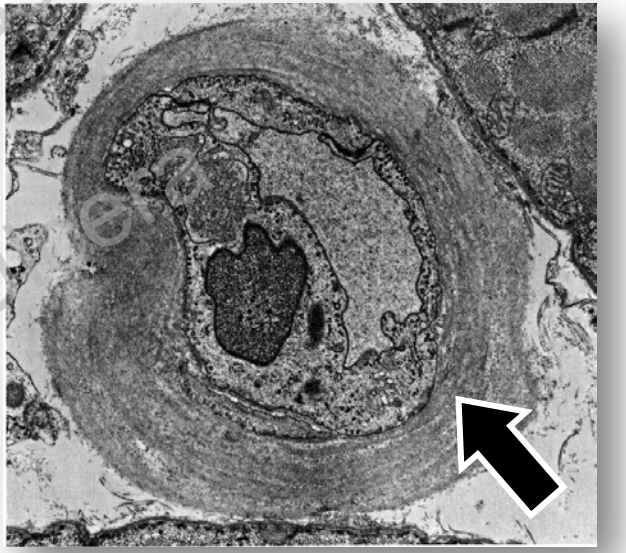
Verdickung der Basallamina



Cross section

capillary abdomen





Cross section

capillary foot

Vracko, Circulation, 1970

Angiologischer Work-up

1. **Anamnese (60% der Diagnose)**
   - Symptome
   - Risikofaktoren, kardiovaskuläre und Begleiterkrankungen
2. **Klinische Untersuchung (20%)**
   - Inspektion: Haut
   - Palpation: Sensomotorik, Hauttemperatur, Pulse
   - Auskultation: Strömungsgeräusche
3. **Funktionelle Messungen (10%)**
   - Ankle-Brachial-Pressure Index
   - Pulsvolumenkurven/Oszillographie
4. **Bildgebung (10%)**
   - Duplex-Sonographie
   - Angio-CT/MRA
   - Angiogaphie

Anamnese

Beschwerden

- Claudicatio
- Ruheschmerzen
- Wunden

- Sonstige Beschwerden in Bereich der unteren Extremitäten

Risikofaktoren

- Diabetes
- Rauchen
- Familienanamnese
- Hypertonie
- Hypercholesterin-ämie

Begleitende Erkrankungen

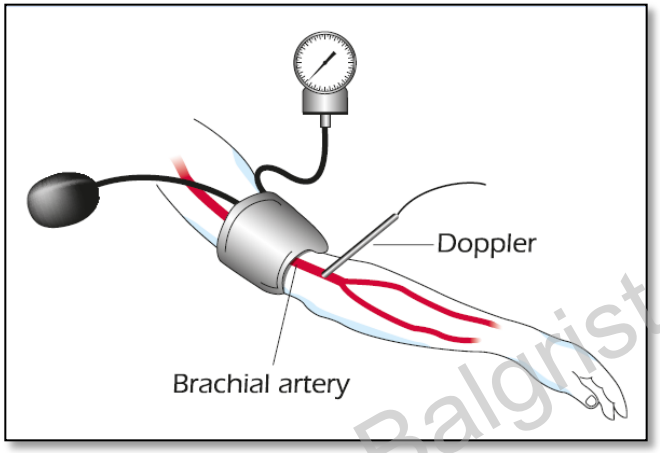
- KHK/Cerebrovaskulär
- Venöse Insuffizienz
- Niereninsuffizienz
- Rheumatologische Erkrankungen

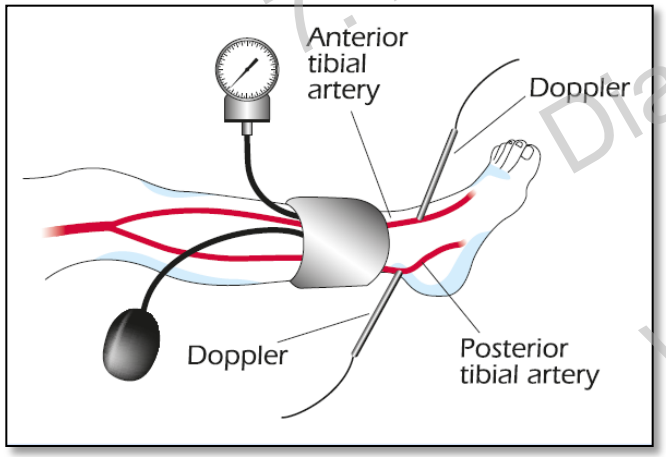
Klinische Untersuchung

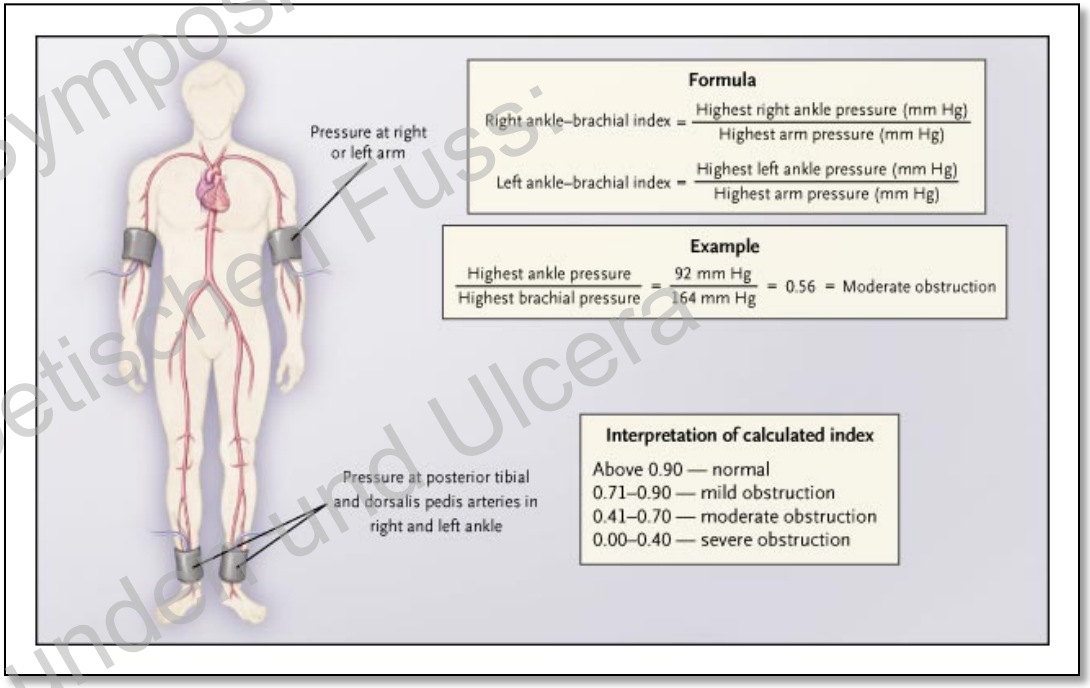
Stadien nach Fontaine

Stadium		Symptomatik
Stadium I		symptomfrei, meist klinischer Zufallsbefund (z.B. fehlende periphere Pulse)
Stadium II		Claudicatio intermittens
	IIa	beschwerdefreie Gehstrecke > 200m
	IIb	beschwerdefreie Gehstrecke < 200m
Stadium III		Ruheschmerz
Stadium IV		Trophische Störungen (Nekrosen, Ulzera, Gangrän)

Ankle-Brachial-Index (ABI)







White C. N Engl J Med 2007;356:1241-1250

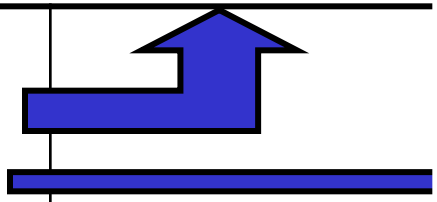
PAVK Stadium und Messungen

	PAVK Fontaine	ABI
Normal		>0.9
Leichte	I-II	0.7-0.9
Mittel schwer	I-II	0.5-0.7
Schwer/kritisch	I-IV	<0.5
Medicalcinosis	I-IV	>1.3

PAVK Stadium und Messungen

	PAVK Fontaine	ABI	Knöcheldruck
Normal		>0.9	
Leichte	I-II	0.7-0.9	
Mittel schwer	I-II	0.5-0.7	
Schwer/kritisch	I-IV	<0.5	<50 mmHg
Medicalcinosis	I-IV	>1.3	>200mmHg (Inkompressibel) >50mmHg über P*syst*

PAVK Stadium und Messungen

	PAVK Fontaine	ABI	Knöcheldruck	Grosszehendruck
Normal		>0.9		
Leichte	I-II	0.7-0.9		
Mittel schwer	I-II	0.5-0.7		
Schwer/kritisch	I-IV	<0.5	<50 mmHg	<30mmHg
Medicalcinosis	I-IV	>1.3	>200mmHg (Inkompressibel) >50mmHg über P*syst*	

PAVK Stadium und Messungen

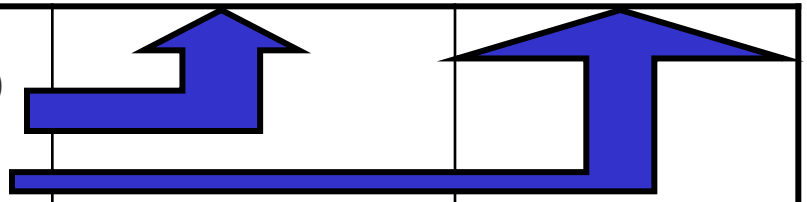
	PAVK Fontaine	ABI	Knöcheldruck	Grosszehendruck	tcPO2
Normal		>0.9			>60mmHg
Leichte	I-II	0.7-0.9			40-60mmHg
Mittel schwer	I-II	0.5-0.7			20-40mmHg
Schwer/kritisch	I-IV	<0.5	<50 mmHg	<30mmHg	<20mmHg
Medicalcinosis	I-IV	>1.3	>200mmHg (Inkompressibel) >50mmHg über P*syst*		

Definition (CLI)

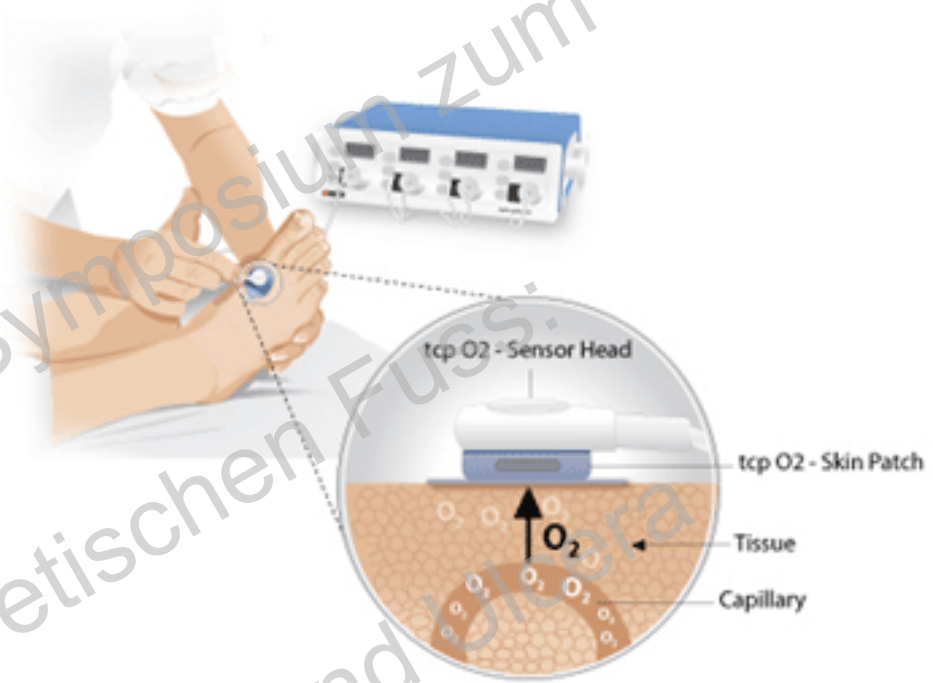
Knöcheldruck:

<50mmHg

<70-80mmHg + Wunde



Transkutane Sauerstoffspannung



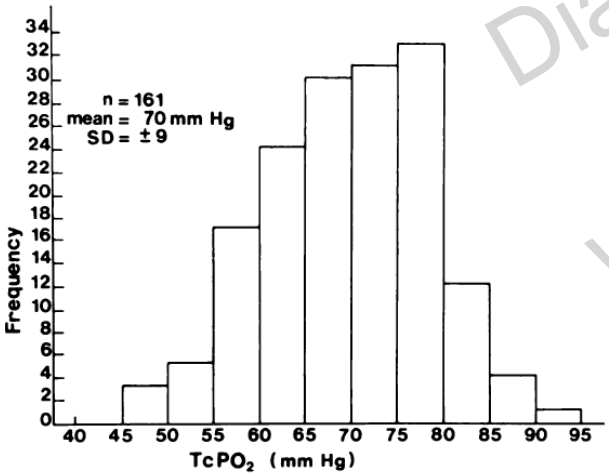
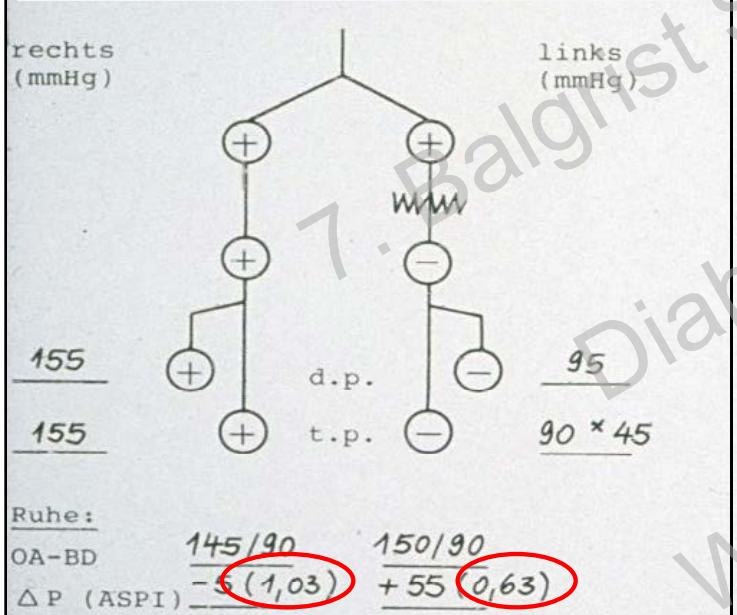
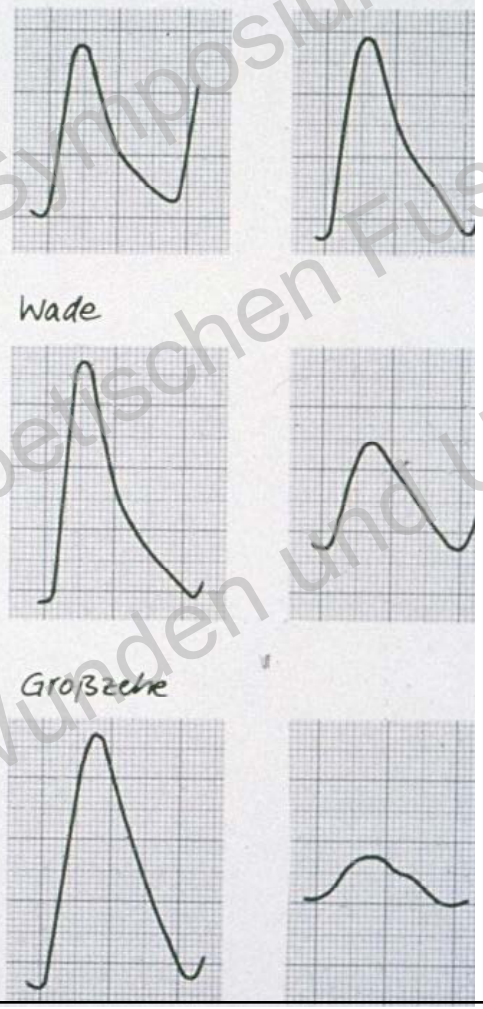
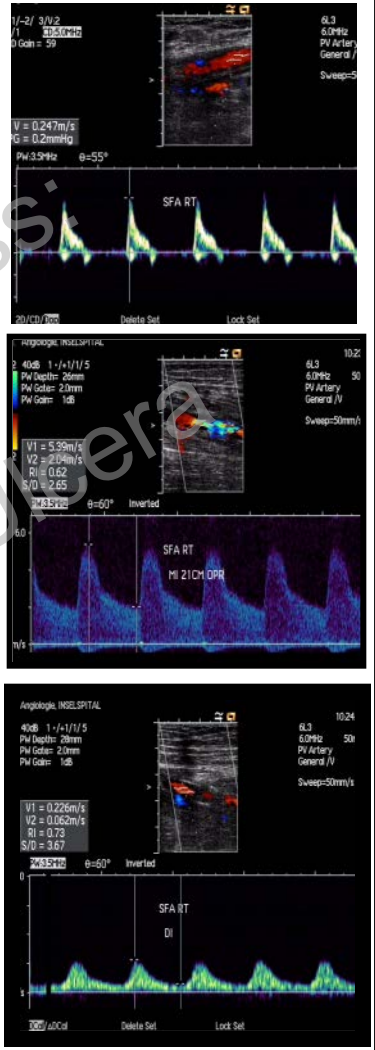
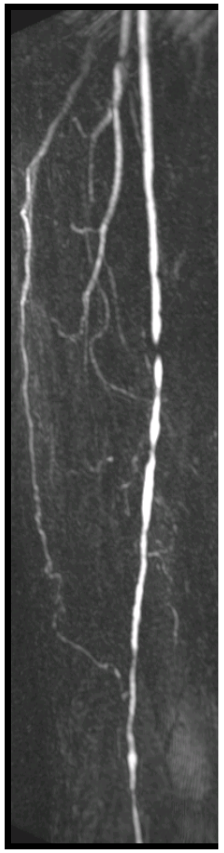


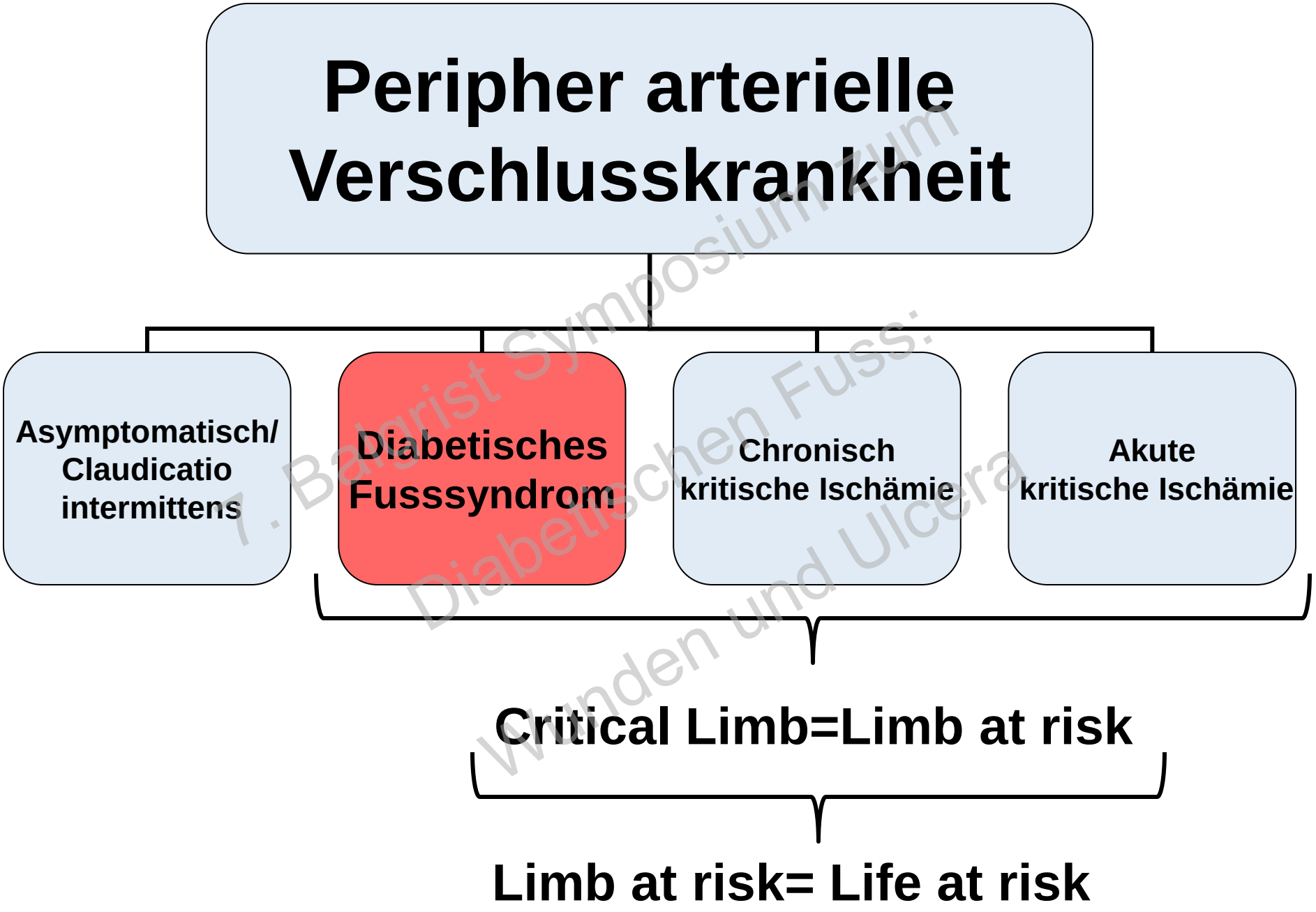
Fig. 2

Histogram of the tcPo_2 recorded in the legs of 161 normal volunteers.

	tcPO2 (mmHg)
Normal	>60
Mild	40-50
Mild-severe	20-40
Severe	<20

Angiologische Evaluation

Pulsstatus/Auskultation und ABI	Pulsvolumenkurven	Duplex	MRI
Pulsschema  **Knöchel-Arm-Index**			



Fazit angiologische Evaluation

„Wer viel misst, misst viel Mist“

Diabetisches Fusssyndrom > 14 Tage

↓

Kein Puls und oder Knöcheldruck >200mmHg oder <80-100mmHg

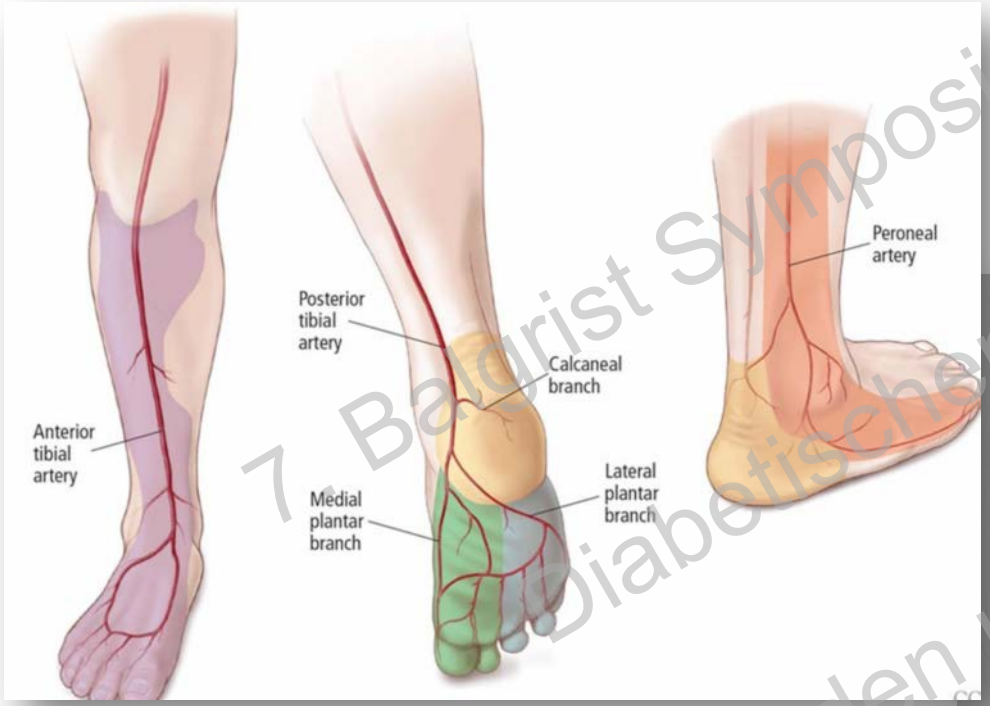
↓

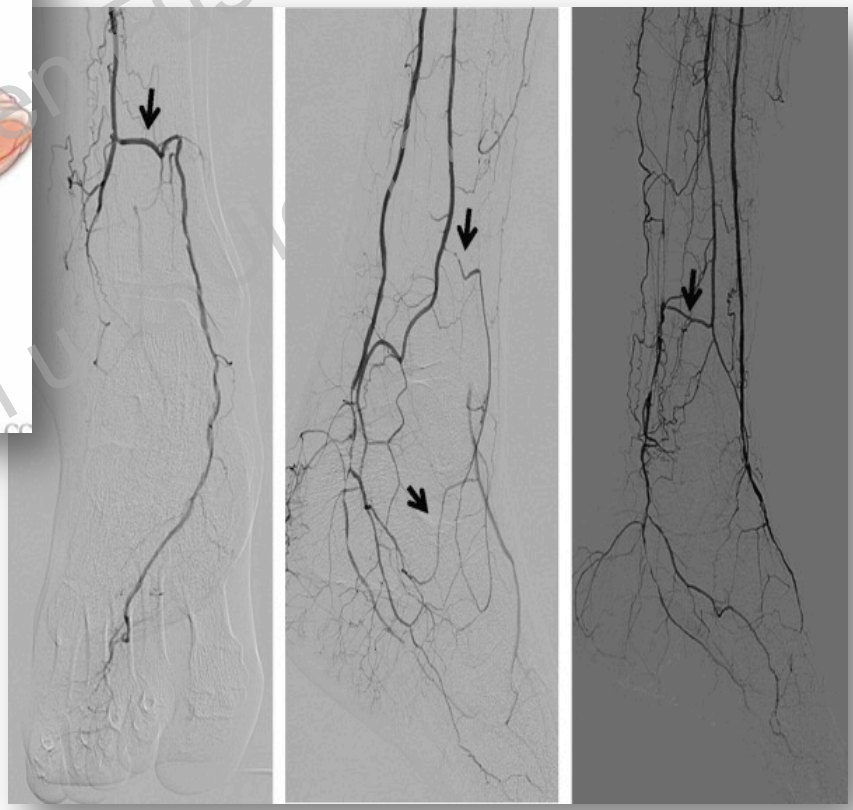
Angiologische Evaluation (Oszillo/Duplex)

↓

Angiographie in PTA-Bereitschaft

Angiosome-Konzept





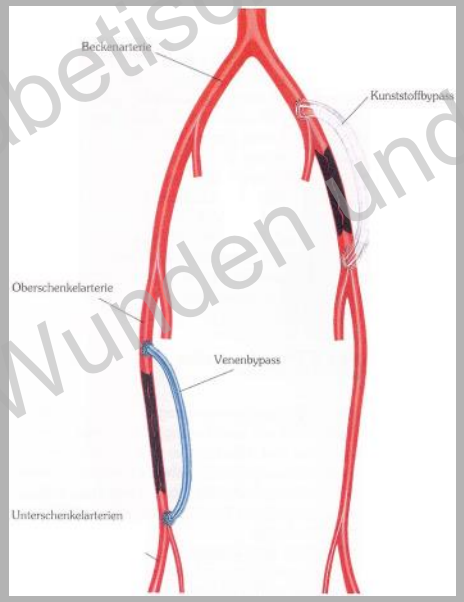
Therapie

Lebensstil und Medikamente

Nikotinabstinenz
Gewicht reduzieren
Bewegung

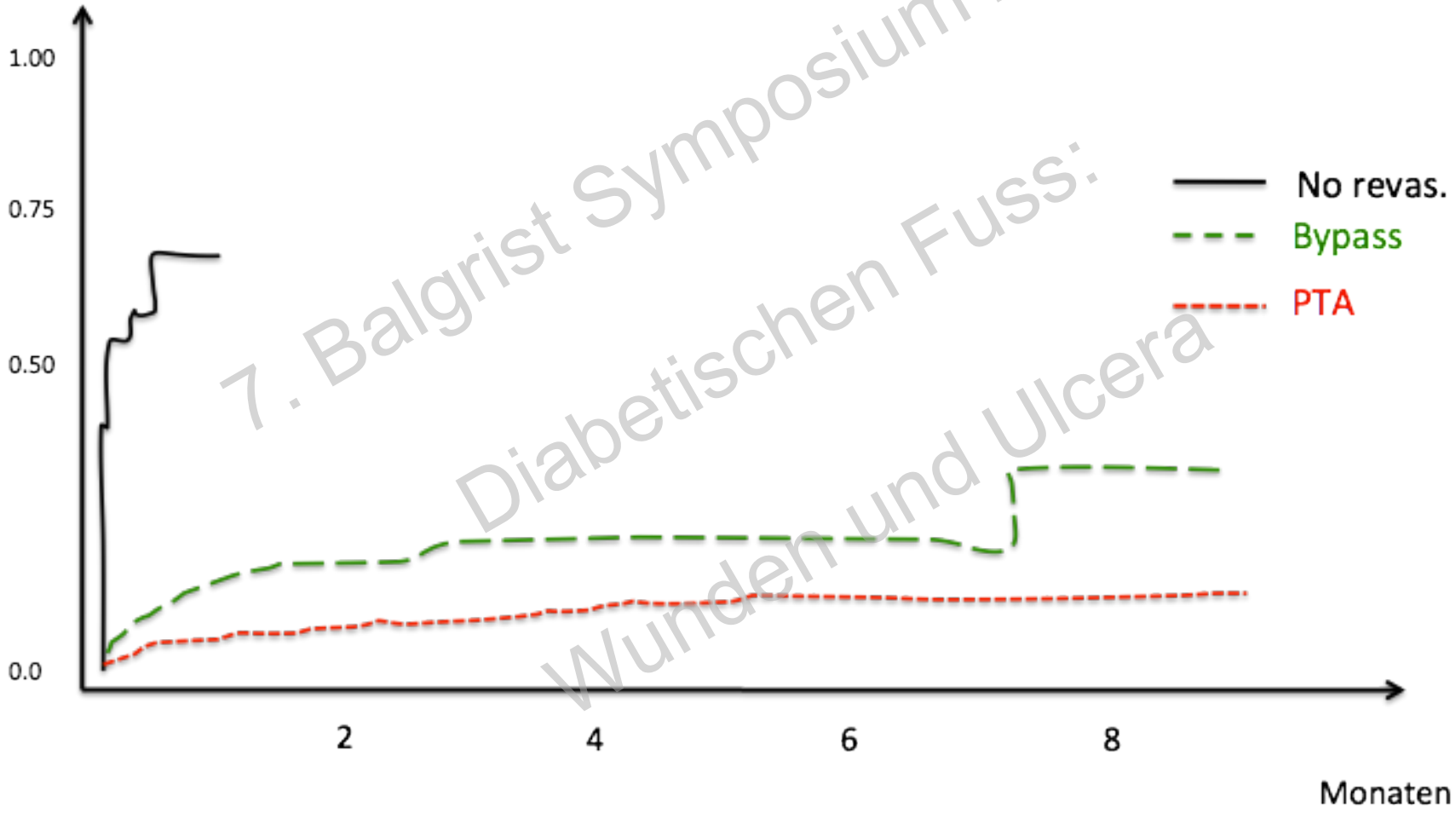
Plättchenhemmer
Cholesterinsenker
Blutdruckmedikamente
Antidiabetika

Revaskularisation



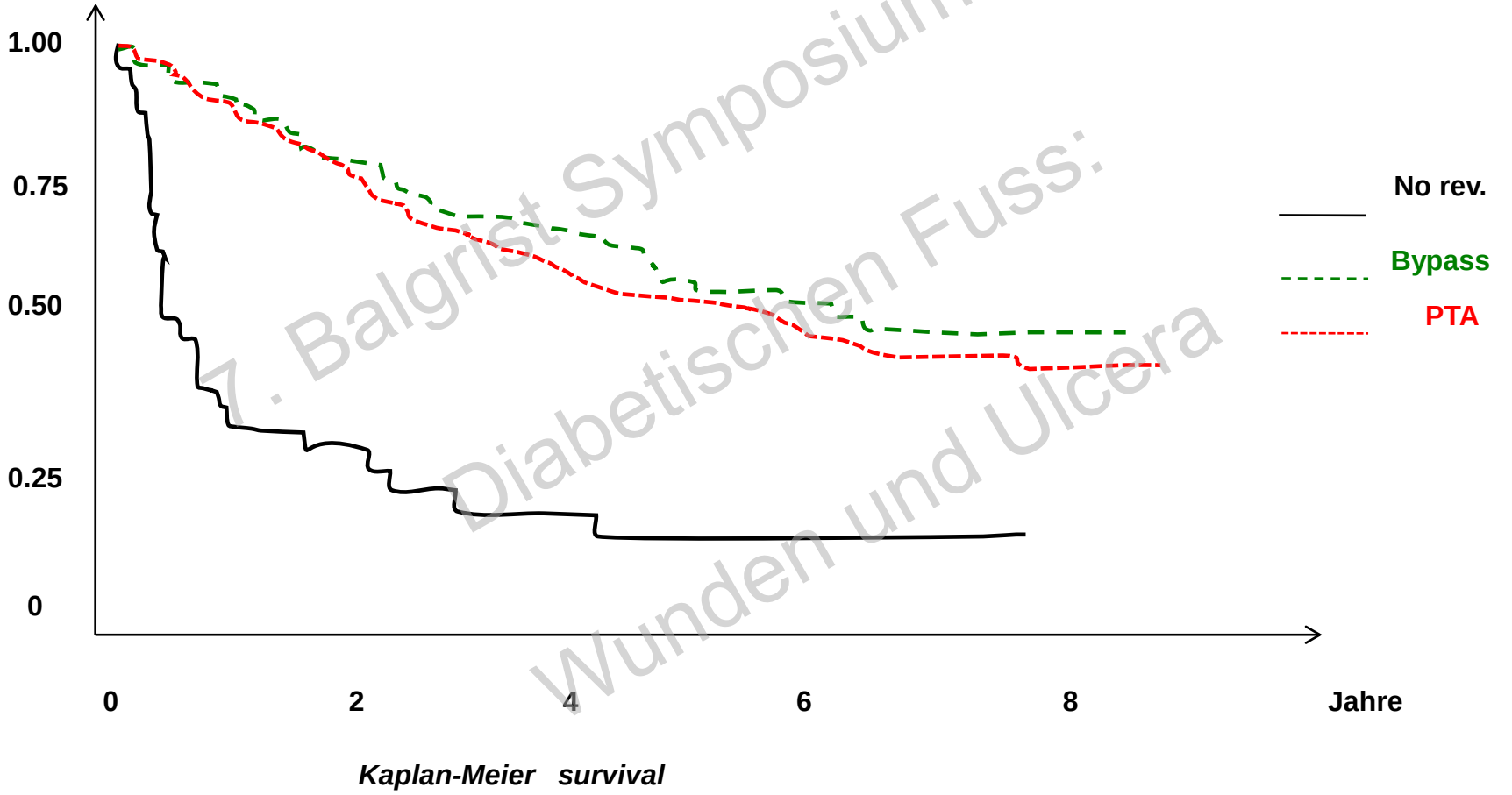
Wundbehandlung

Amputationsrate bei Diabetes



Diabetes Care 32:822–827, 2009

Mortalität bei Diabetes und PAVK



Kaplan-Meier survival

Diabetes Care 32:822–827, 2009

76-jähriger Mann

- PAVK Stadium I-II kompliziert

Druckwerte

	rechts	links (mm Hg)
Oberarm (RR)		170/80
A. dors. pedis	>200	>200
A. tib. post.	180	>200
A. fibularis	>200	>200
ABI	>1,3	>1,3

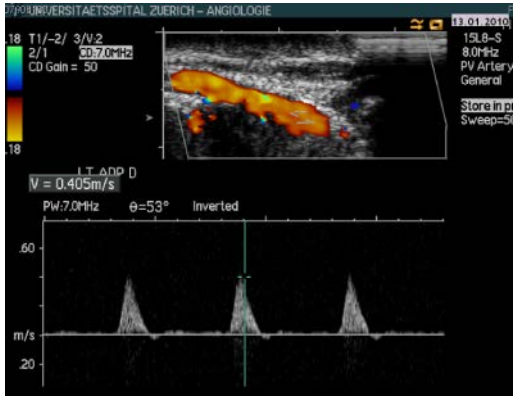
Grosszehendruck rechts 50mmHg, links 10mmHg

Druckwerte

	rechts	links (mm Hg)
Oberarm (RR)		170/80
A. dors.pedis	>200	>200
A. tib.post.	180	>200
A. fibularis	>200	>200
ABI	>1,3	>1,3
Grosszehendruck	rechts 50mmHg	links 10mmHg

Druckwerte

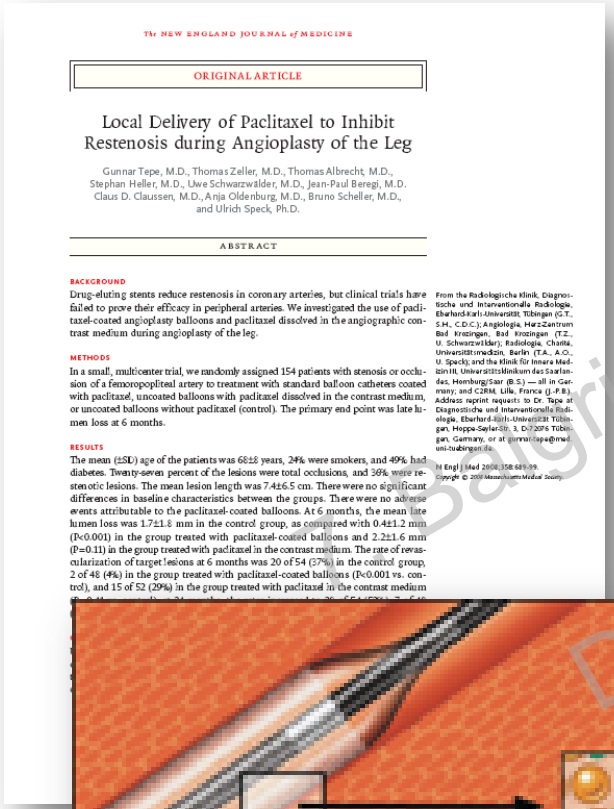
	rechts	links (mm Hg)
Oberarm (RR)		145/65
A. dors.pedis	>200	>200
A. tib.post.	>200	>200
A. fibularis	>200	>200
Grosszehe	105	125



Revaskularisation

1. **ACHIEVE PATENCY**
   - Endovaskulär vor Chirurgie, kombiniert, diskutiert
   - Neue Endo-Technology (Wires, Crossing-Devices, low-profil balloons, ..)
2. **CONTROL PATENCY**
   - Vessel Re-coil, Re-thrombosis, Neointimal proliferation, atherogenesis
   - Follow-up mit Oszillographie/Duplex
3. **MAINTAIN PATENCY**
   - Re-Intervention, Drug-coating technology, ...
   - Duale Plättchenhemmung mit Aspirin und Clopidogrel

Drug-eluting Balloons



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Local Delivery of Paclitaxel to Inhibit Restenosis during Angioplasty of the Leg

Gunnar Tepe, M.D., Thomas Zeller, M.D., Thomas Albrecht, M.D., Stephan Heller, M.D., Uwe Schwarzwälder, M.D., Jean-Paul Beregi, M.D. Claus D. Claussen, M.D., Anja Oldenburg, M.D., Bruno Scheller, M.D., and Ulrich Speck, Ph.D.

ABSTRACT

BACKGROUND

Drug-eluting stents reduce restenosis in coronary arteries, but clinical trials have failed to prove their efficacy in peripheral arteries. We investigated the use of paclitaxel-coated angioplasty balloons and paclitaxel dissolved in the angiographic contrast medium during angioplasty of the leg.

METHODS

In a small, multicenter trial, we randomly assigned 154 patients with stenosis or occlusion of a femoropopliteal artery to treatment with standard balloon catheters coated with paclitaxel, uncoated balloons with paclitaxel dissolved in the contrast medium, or uncoated balloons without paclitaxel (control). The primary end point was late lumen loss at 6 months.

RESULTS

The mean (±SD) age of the patients was 68±8 years, 24% were smokers, and 49% had diabetes. Twenty-seven percent of the lesions were total occlusions, and 36% were restenotic lesions. The mean lesion length was 7.4±6.5 cm. There were no significant differences in baseline characteristics between the groups. There were no adverse events attributable to the paclitaxel-coated balloons. At 6 months, the mean late lumen loss was 1.7±1.8 mm in the control group, as compared with 0.4±1.2 mm ($P<0.001$) in the group treated with paclitaxel-coated balloons and 2.2±1.6 mm ($P=0.11$) in the group treated with paclitaxel in the contrast medium. The rate of revascularization of target lesions at 6 months was 20 of 54 (37%) in the control group, 2 of 48 (4%) in the group treated with paclitaxel-coated balloons ($P<0.001$ vs. control), and 15 of 52 (29%) in the group treated with paclitaxel in the contrast medium

From the Radiologische Klinik, Diagnostische und Interventionelle Radiologie, Eberhard-Karl-Universität, Tübingen (G.T., S.H., C.D.C.); Angiologie, Herz-Zentrum Bad Krozingen, Bad Krozingen (T.Z., U. Schwarzwälder); Radiologie, Charité, Universitätsmedizin, Berlin (T.A., A.O., U. Speck); and the Klinik für Innere Medizin III, Universitätsklinikum des Saarlandes, Homburg/Saar (B.S.) — all in Germany; and CERM, Lille, France (J.-P.B.). Address reprint requests to Dr. Tepe at Diagnostische und Interventionelle Radiologie, Eberhard-Karl-Universität Tübingen, Hoppe-Seyler-Str. 3, D-72076 Tübingen, Germany, or at gunnar.tepe@med.uni-tuebingen.de.

N Engl J Med 2008;358:689-99.

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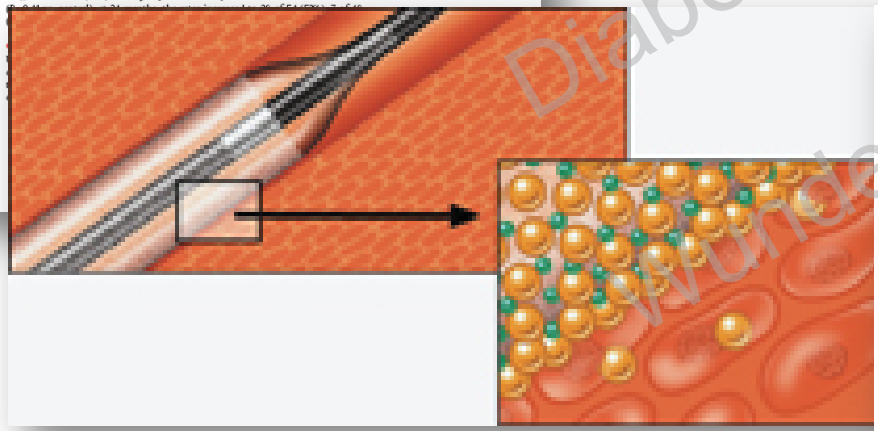
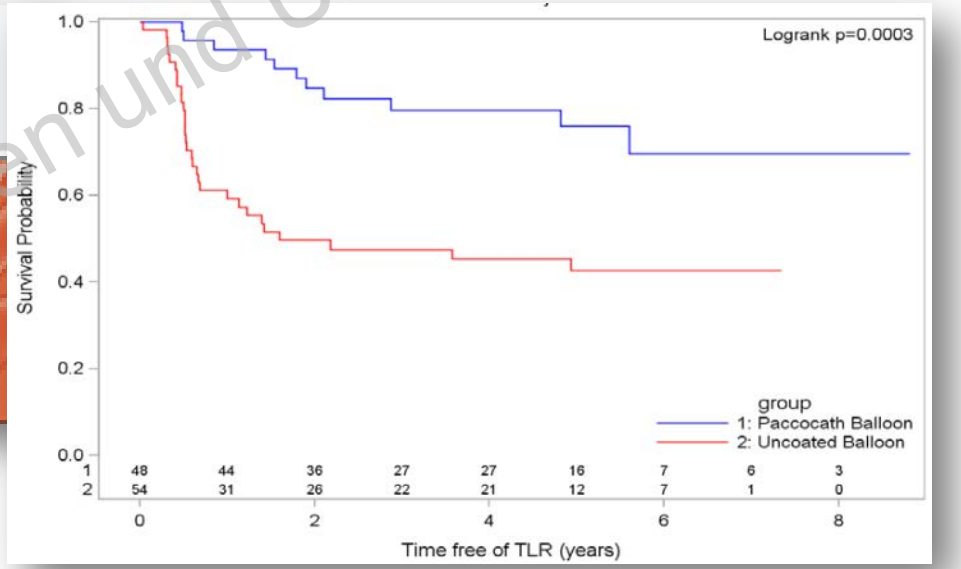
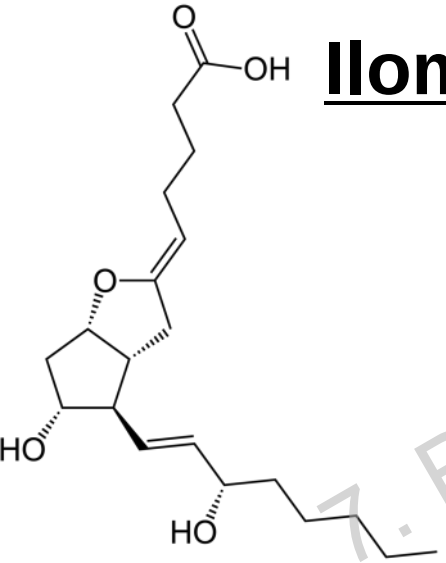
- Lokale Abgabe der antiproliferative Medikament (paclitaxel)
- Positive Resultate für femoro-poplitealen Bereich
- Unklar für krurale Läsionen





Medikamentöse „Revaskularisation“



Ilomedin

Prostacyclin effect		Mechanism	Cellular response
Classical functions	Vessel tone	↑cAMP, ↓ET-1 ↓Ca^{2+}, ↑K^{+}	↓SMC proliferation ↑Vasodilation
	Antiproliferative	↑cAMP ↑PPARgamma	↓Fibroblast growth ↑Apoptosis
	Antithrombotic	↓Thromboxane-A2 ↓PDGF	↓Platelet aggregation ↓Platelet adherence to vessel wall
Novel functions	Antiinflammatory	↓IL-1, IL-6 ↑IL-10	↓Proinflammatory cytokines ↑Antiinflammatory cytokines
	Antimitogenic	↓VEGF ↓TGF-β	↓Angiogenesis ↑ECM remodeling

Ulkus Heilung: **51% vs 28% (Placebo)**

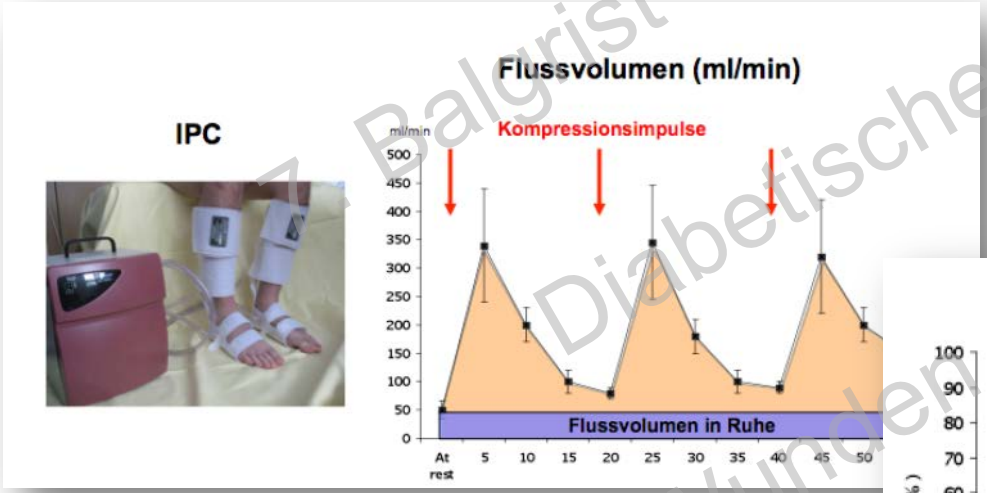
↓ Major Amp: **31% vs 44% (Placebo)**

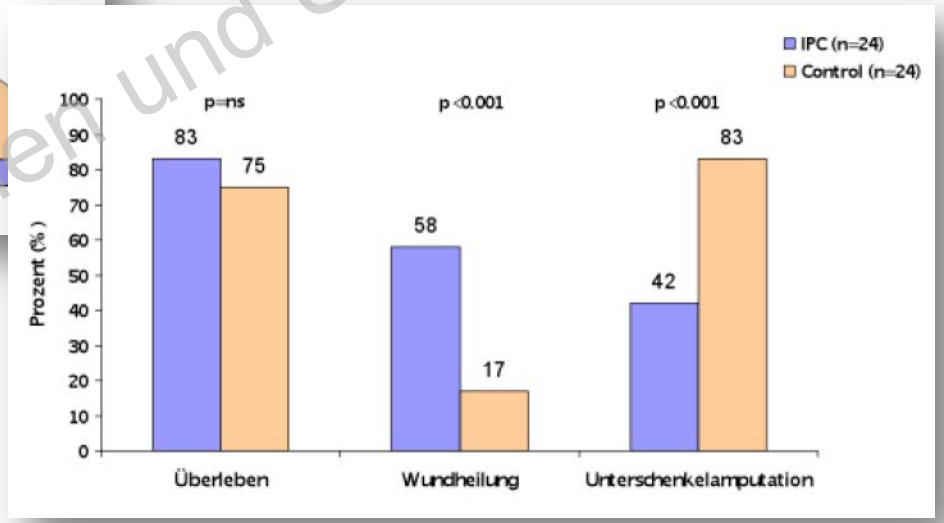
- **NW: Hypotonie, Kopfschmerzen, Flush, Nausea, Erbrechen**
- **Therapie während 2-3 Wochen/5h Infusion**

Cochrane Library, 5 RCT‘s, n=604)

Biomechanische „Revaskularisation“

- **Gehtraining**
- **Intermittierende pneumatische Kompression**





Kavros SJ, J Vasc Surg. 2008;47(3):543-9

Angiologische Evaluation…

- **Durchblutung zum Wund-Angiosome**
  - Abhängig von Risikofaktoren (multilevel disease)
  - Knöcheldruckwerte:
    - Palpabler Pulse → Druck >100mmHg ausreichend
    - Wunde und Druck < 80-100mmHg→ kritisch
  - Oszillographie: rasche Segment-Diagnostik
  - Duplexsonographie: genaue Diagnostik und Planung der Intervention

...und Behandlung

- **Systemische Behandlung → Senkung des kv Risikos**
  - Plättchenhemmer, Statin, Antihypertensiva, Antidiabetika
- **RASCHE Revaskularisation Wund-Angiosome als Ziel**
  - Endovaskulär (Angiographie) vor Chirugie
  - Verbesserung der Offenheitsrate durch drug-coating technology
  - Vaskulärer Follow-up mit Oszillographie/Duplexsonographie
  - *Ilomedin und pneumatische Kompression*
- **Therapie weiterer Probleme**
  - Venöser Insuffizienz (Kompression, Ligatur, EVTA, Sklero)
  - Venöser Hypertonie (venöse PTA bei PTS)
  - Anämie, Metabolismus, Infekt, Herzinsuffizienz, ...