

Symposium Diabetischer Fuss

Diabetischer Fuss – eine Frage der Nerven?

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Geschichte



Diabetischer Fuss = Charcot-Neuro-Arthropathie (englischspr.Lit.)
Erstbeschreibung Jean-Marie Charcot (1825-1893): 1868*, Arbeit als Pathologe

«...So, unlike the usual course, the joint had initially been red and slightly painful, in fact only for a few days. Moreover when joint changes started, the symptoms of motor incoordination had already developed for many years, whereas in the other patients the onset of incoordination was more recent, relative to the arthropathy. We believe however, that these differences are of secondary importance and only reflect simple variations of the same disease.»

... beschreibt Veränderungen an Knochen und Gelenken infolge neurologischer Störungen (u.a. Tabes dorsalis bei tertiärer Syphilis)

***Charcot JM.** Sur quelques arthropathies qui paraissent dependre d'une lesion du cerveau ou de la moelle epiniere. *Arch Physiol (Paris)* 1868;1:161–178.

Geschichte



Diabetischer Fuss = Charcot-Neuro-Arthropathie (englischspr.Lit.)
Erstbeschreibung Jean-Marie Charcot (1825-1893): 1868*, Arbeit als Neuropathologe

Einrichtung des ersten Lehrstuhls für «Erkrankungen des Nervensystems» im
Hôpital Pitié de la Salpêtrière, Paris, 1882



***Charcot JM.** Sur quelques arthropathies qui paraissent dependre d'une lesion du
cerveau ou de la moelle epiniere. *Arch Physiol (Paris)* 1868;1:161–178.

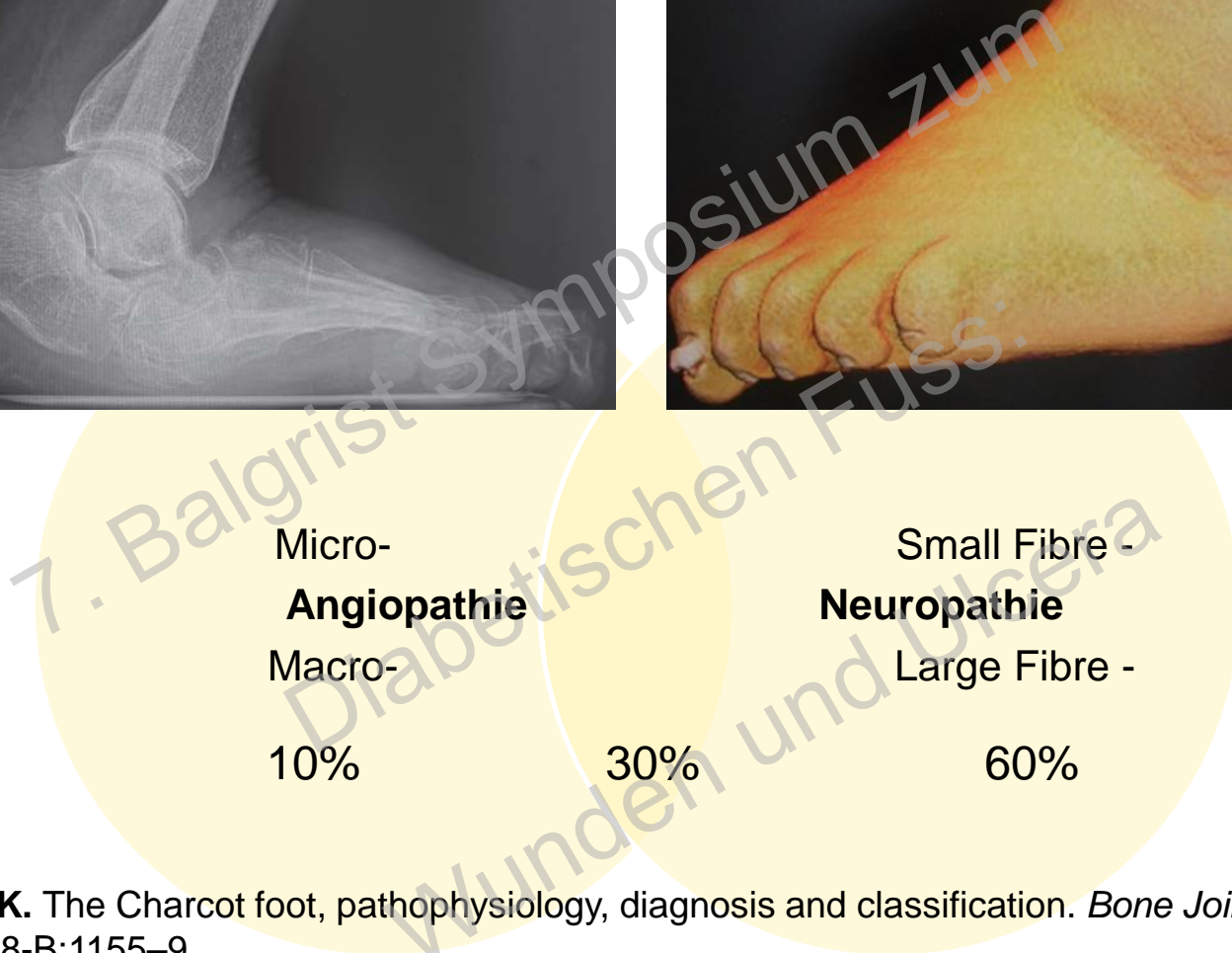
Epidemiologie, Pathophysiologie

Diabetischer Fuss:

- Häufigste Indikation für non-traumatische Amputation der unteren Extremitäten
- Hauptgrund einer Hospitalisation bei Diabetes mellitus
- Früherkennung, Prävention, Komplikationsbehandlung = entscheidend für Ergebnis
- Pathophysiologie = **neurovasculäres** und **mechanisches** Micro-Trauma:
 - autonome** Neuropathie → Gefässweite → AV-Shunting → Entzündung & Resorption
 - sensible** Neuropathie → Verlust der Schmerzsensibilität → Microtrauma & Verletzung
- Prävalenz (altersabh.): > 1% (-10%) aller Diabetiker, 10% - 30% bilateral
- Auftreten: in der 5. Dekade, 80% D.m. >10J.
- RF: Übergewicht, Neuropathie, Alter, Dauer, HbA1c-Erhöhung, Eisenmangel-Anämie, Osteoporose, Rh.a., Alkohol, Nikotin ...
- Inflammation, MicroFx, Deformität – Hautulcerationen – Infektion (Osteomyelitis 50%)

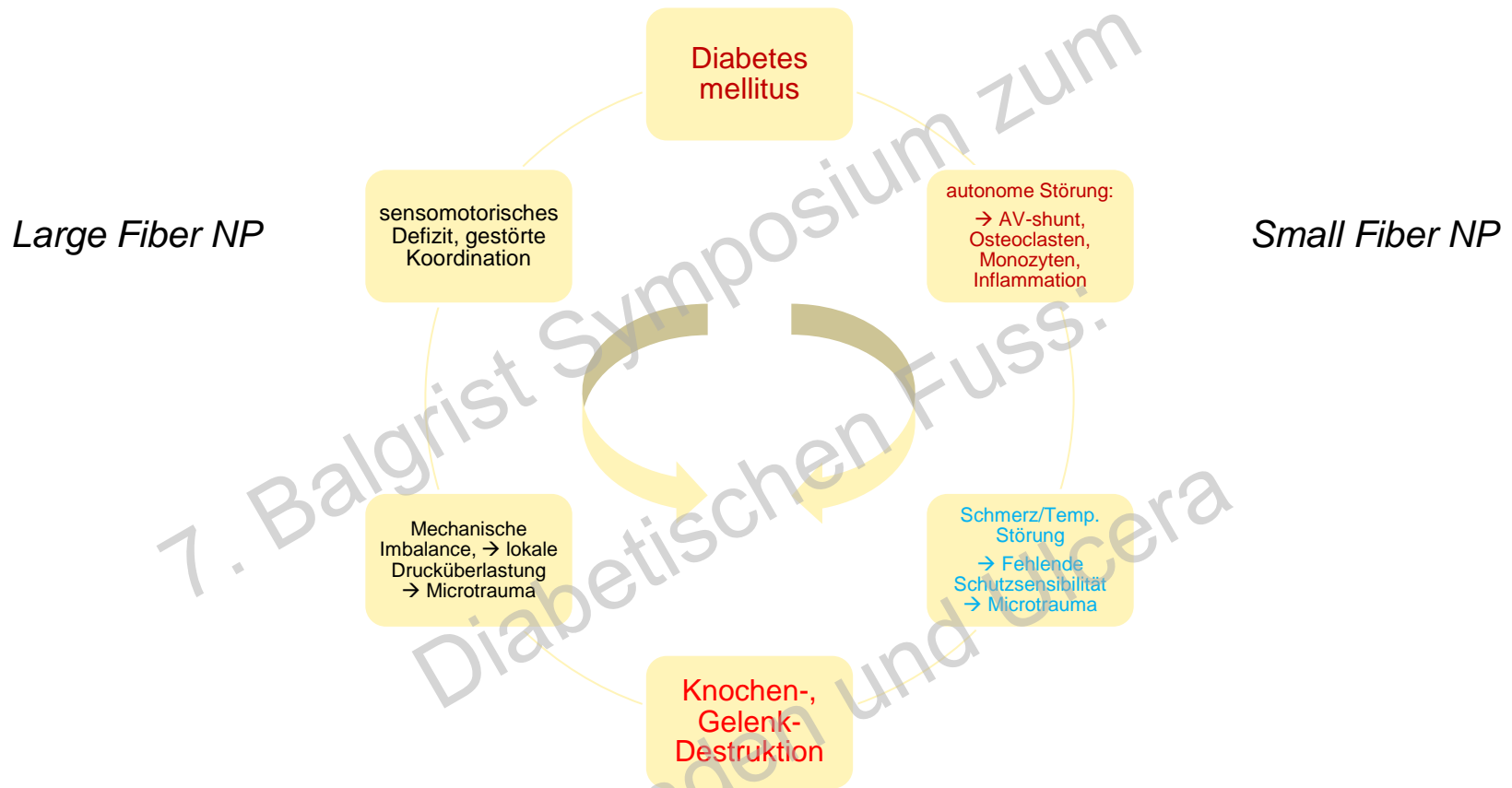
Trieb, K. The Charcot foot, pathophysiology, diagnosis and classification. *Bone Joint J* 2016;98-B:1155–9.

Pathophysiologie diabetischer Fuss



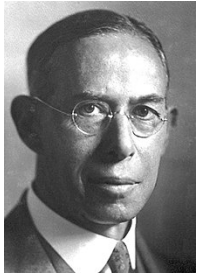
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Pathophysiologie Neuropathie



Trieb, K. The Charcot foot, pathophysiology, diagnosis and classification. *Bone Joint J* 2016;98-B:1155–9.

Pathophysiologie: Prädilektionstypen Neuropathie



Joseph Erlanger & Herbert Gasser: erhielten 1944 für die Entdeckung und Beschreibung der hochdifferenzierten Funktionen einzelner Nervenfasern Nobelpreis für Medizin

Guy et al. Evaluation of **thermal** and vibration sensation in diabetic neuropathy. *Diabetologie* 1985;28:131-7.

...Sensory evaluation of diabetic neuropathy was undertaken by a new technique for assessment of **thermal sensitivity**. The method is simple and reproducible [...] Four groups of patients with diabetic neuropathy were examined: 22 with neuropathic ulcers and/or Charcot joints: all showed severe abnormalities, frequently more than **three times the upper limit of normal**...

Stewart et al. Distal **small fiber neuropathy**: results of tests of sweating and autonomic cardiovascular reflexes. *Muscle Nerve* 1992;15:661-5.

Chan et al. Clinical reasoning: **burning hands and feet**. *Neurology* 2015;84:146-52.



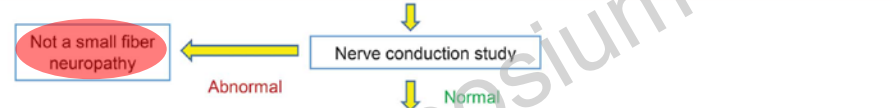
Large**F**iber**N**euro**P**athy (zB Mononeuropathia multiplex)

längenabh. **S**mall**F**iber**N**euro**P**athy

Algorithmus SFNP

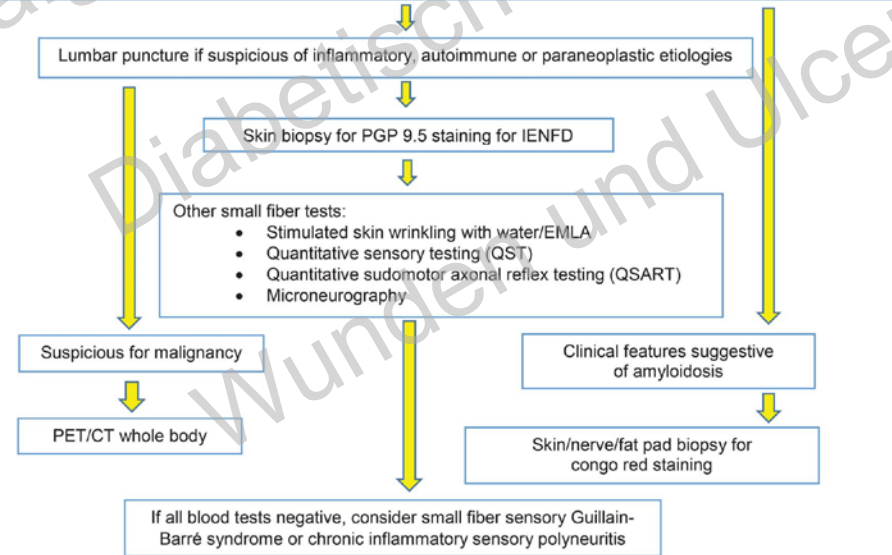
Clinical features of small fiber neuropathy

- **Positive** sensory symptoms like: tingling, burning, prickling, shooting pain, or aching
 - Worse at night and may interfere with sleep
 - Allodynia, hyperesthesia and cramps
 - May also have negative symptoms like numbness, tightness and coldness
 - Distal and length dependent
 - Autonomic symptoms – increased/decreased sweating, facial flushing, skin discoloration, dry eyes and mouth, changes in skin temperature, orthostatic hypotension or enteric symptoms
 - Impaired thermal and pain sensitivity
 - Normal muscle strength, proprioception and tendon reflexes



Check bloods according to clinical suspicion:

- Metabolic (*DM, IFG, hypertriglyceridemia, hypothyroidism*): HbA1C, FG, TFT
- Alcoholism / Nutritional Deficiencies: EtOH level, GGT, MCV, vit B1, vit B12
- Infectious (*HIV, HBC, HBV, Lyme disease*): CRP, HIV, Borrelia burgdorferi, HBV, HCV
- Autoimmune (*Vasculitis, SLE, Sjogren's syndrome, rheumatoid arthritis, connective tissue disease, celiac disease, sarcoidosis*): ESR, ANA, ant-ENA, SLE panel, ANCA, anti-gliadin ab, RF, Serum ACEI, CXR
- Paraneoplastic (*Small cell lung cancer, solid tumors, lymphoma, myeloma, monoclonal gammopathies*): Tumor markers, LDH, myeloma screen, SPE, UPE, anti-Hu and anti-CV2/CRMP-5 antibodies
- Neurotoxins (*Metronidazole, solvents*): Urine + blood toxicology, screen and review drug history
- Hereditary (*Fabry disease, Na_v 1.7 and Na_v 1.8 sodium channelopathies*): Leukocyte alpha-galactosidase A and globotriaosylceramide (Gb₃ or GL-3) levels, renal panel, urine protein, genetic testing for SCN9A, SCN10A

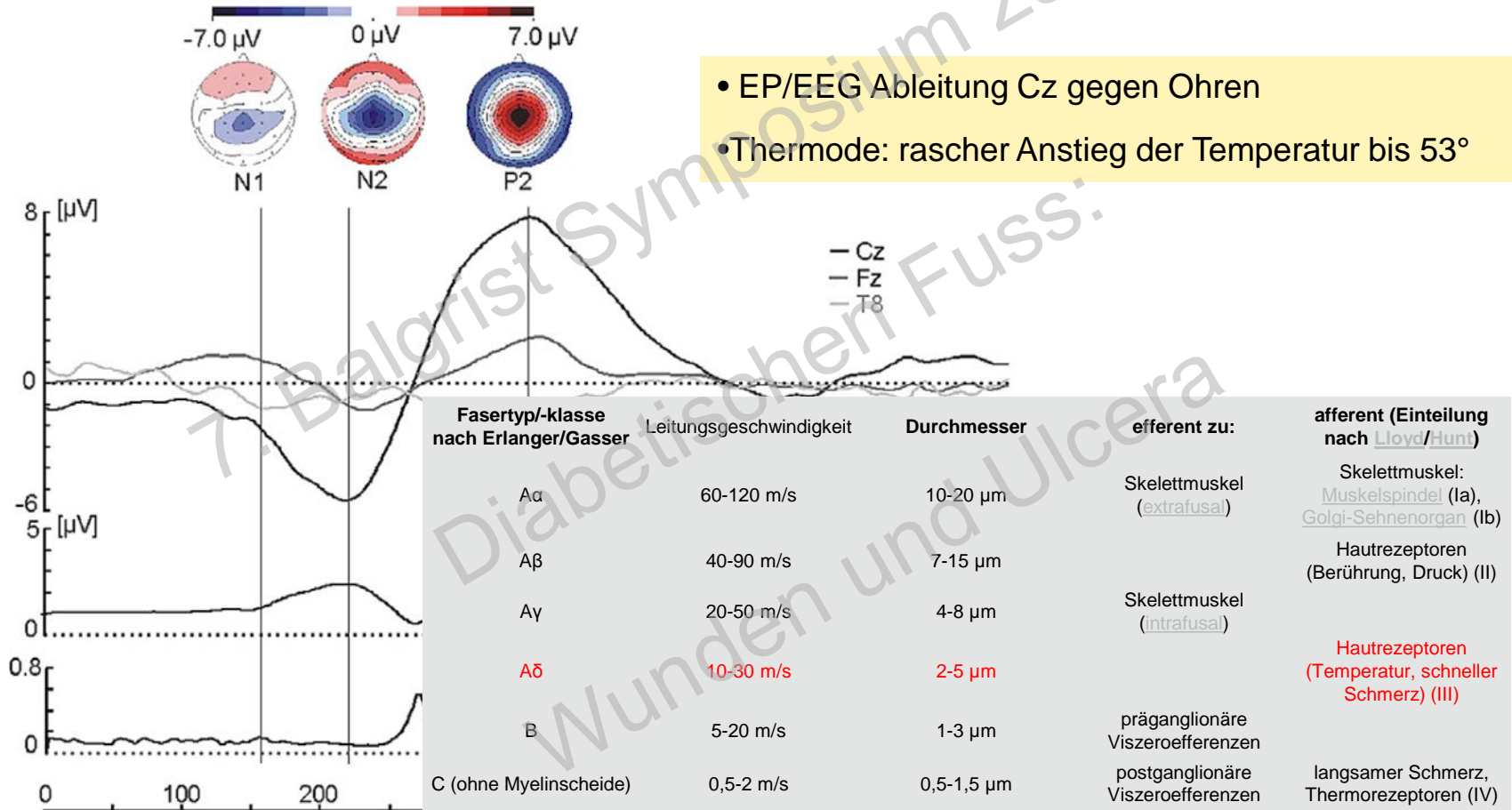


Neurophysiologie: Problem der Diagnostik SFNP

Contact Heat Evoked Potentials

Tractus spinothalamicus ant.; periphere A δ Fasern

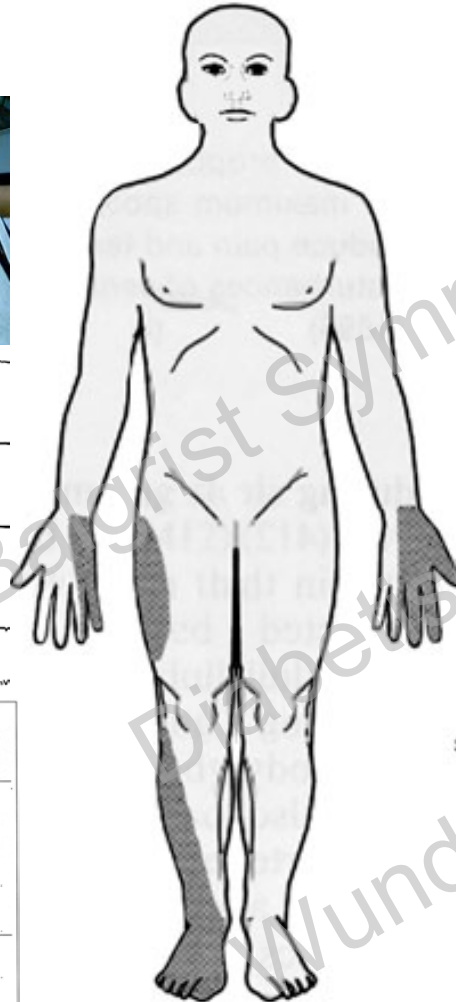
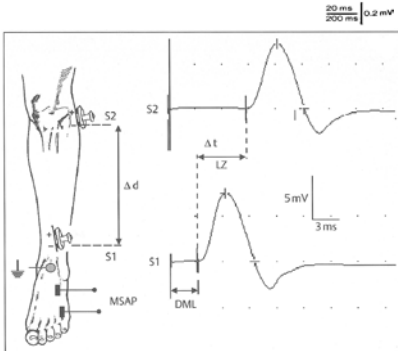
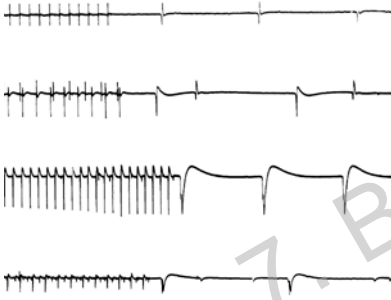
- EP/EEG Ableitung Cz gegen Ohren
- Thermode: rascher Anstieg der Temperatur bis 53°



Wydenkeller S, et al.. Spinothalamic tract conduction velocity estimated using contact heat evoked potentials: What needs to be considered. Clin. Neurophysiol. 2008, 119: 812–21

Pathophysiologie: Zusatzdiagnostik NP

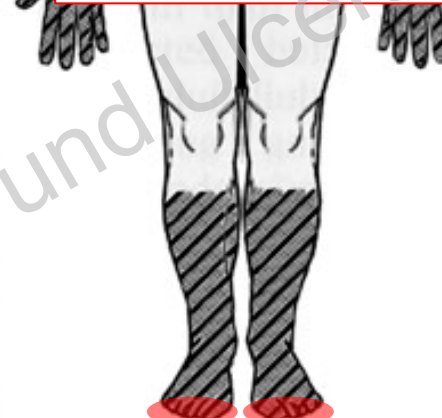
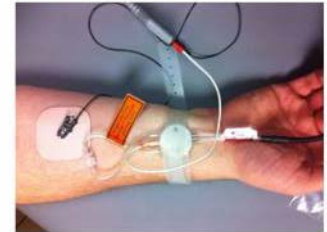
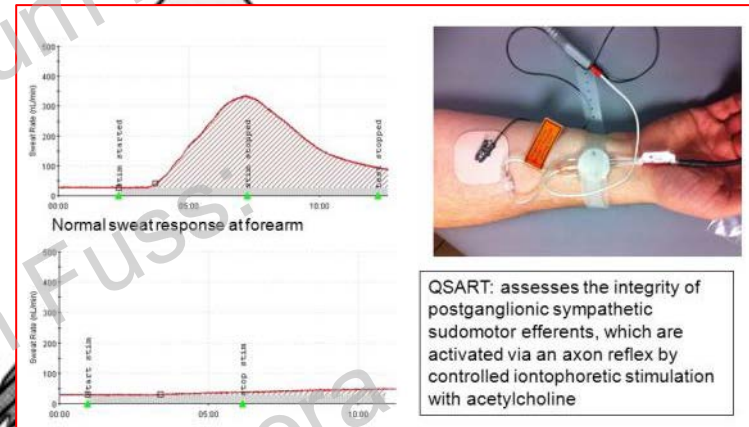
EMG, Neurographie



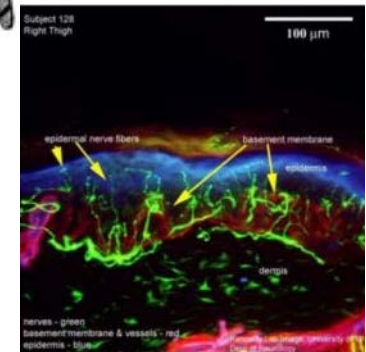
- Sensory loss
- Weakness/motor loss
- Sensory and motor loss

Large **F**iber **N**euro**P**athy (zB Mononeuropathia multiplex)

QSART (Low et al. 1983)
CHEPs, Hautbiopsie
SWMT



längenabh. **S**mall **F**iber **N**euro**P**athy



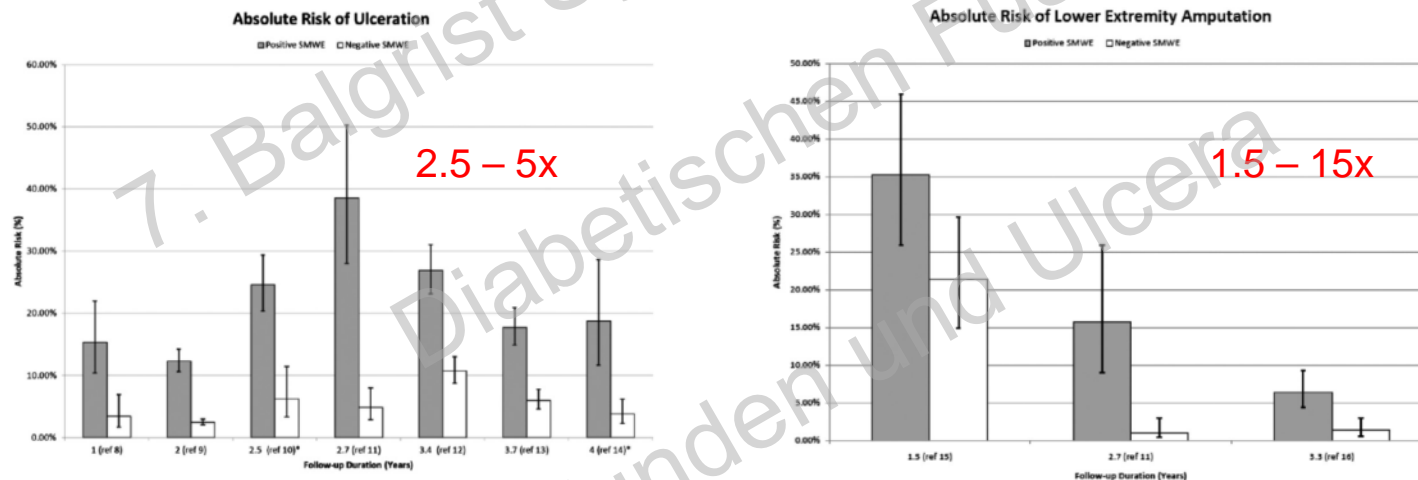
Pathophysiologie: Zusatzdiagnostik SFNP

The Semmes Weinstein monofilament examination is a significant predictor of the risk of foot ulceration and amputation in patients with diabetes mellitus

Yuzhe Feng, Felix J. Schlösser, MD, PhD, and Bauer E. Sumpio, MD, PhD, *New Haven, Conn*



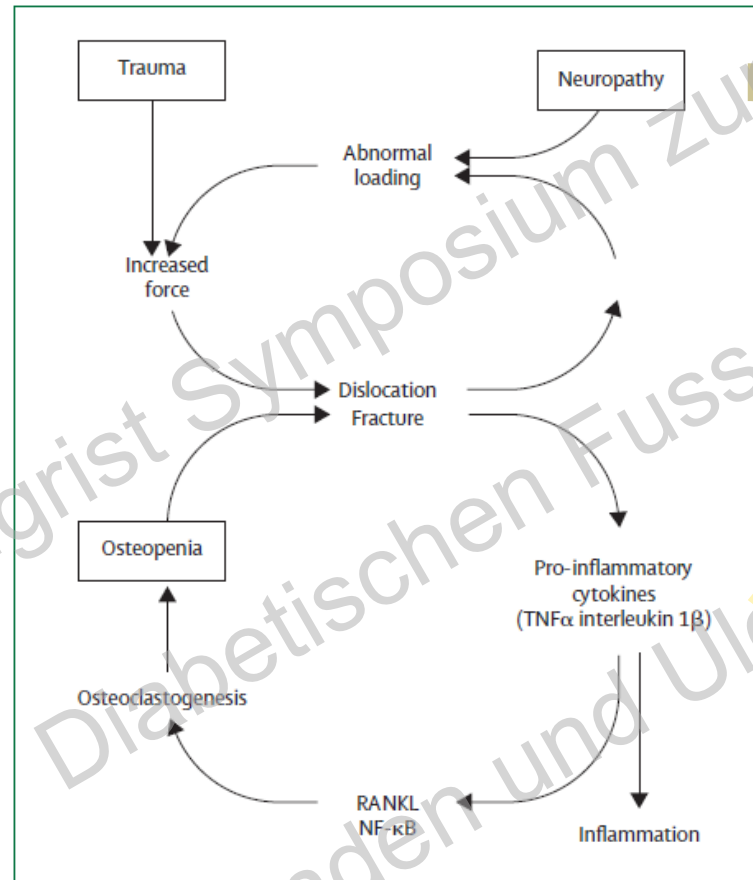
SWM 5.07/10g



Feng et al. The SWME as a screening tool for diabetic peripheral neuropathy. *J Vasc Surg* 2009;50: 675-82.

Feng et al. The SWME is a significant predictor of the risk of foot ulceration and amputation in patients with diabetes mellitus. *J Vasc Surg* 2011;53: 220-6.

Pathophysiologie Inflammation

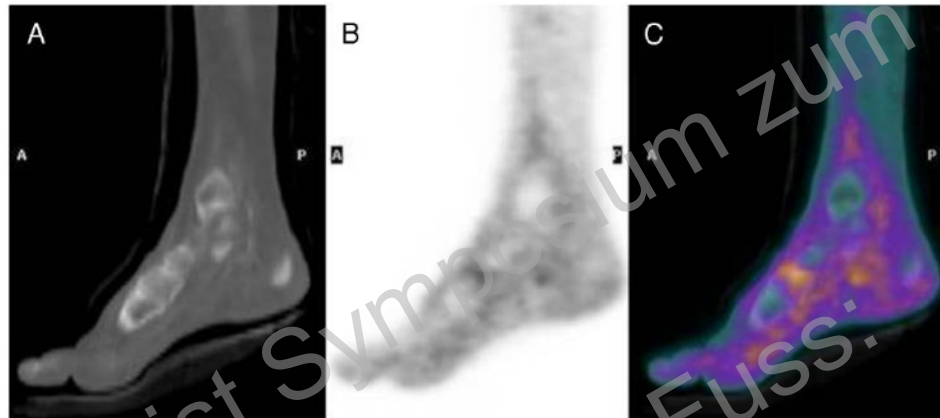


Jeffcoate et al., The role of proinflammatory cytokines in the cause of neuropathic osteoarthropathy (acute Charcot foot). *Lancet* 2005; 2058-61.

Pathophysiologie Inflammation

Charcot Fuss

vor



nach

Therapie



Pickwell et al. F-18 FDG PET/CT Scanning in Charcot Disease. *Clinical Nuclear Medicine* 2011; 36: 8-10.

Ruotolo et al. A natural history of Charcot foot. *Clinical Nuclear Medicine* 2013; 38: 506-9.

Therapie

Diabetischer Fuss mit Neuropathie:

- Ursachenabklärung («PNP Labor») und Behandlung (Vitamine, Entzündung...)
- Kritisch bei Medikamenten (Biguanide → B12 Mangel!, Chemotherapie, Antibiotika...)
- Patientenaufklärung! Bedeutung sensorisches Defizit, Noxen, Lebensführung
- Einstellung des Diabetes Mellitus!
- Cave: zu schnelle Normalisierung des HbA1c → akute schmerzhaftes SFNP
- Patientenführung (Adherence)



Eberhardt & Topka Neurological outcome of antidiabetic therapy: What the neurologist should know. *Clinical Neurology and Neurosurgery* 2017; 158: 60-66.

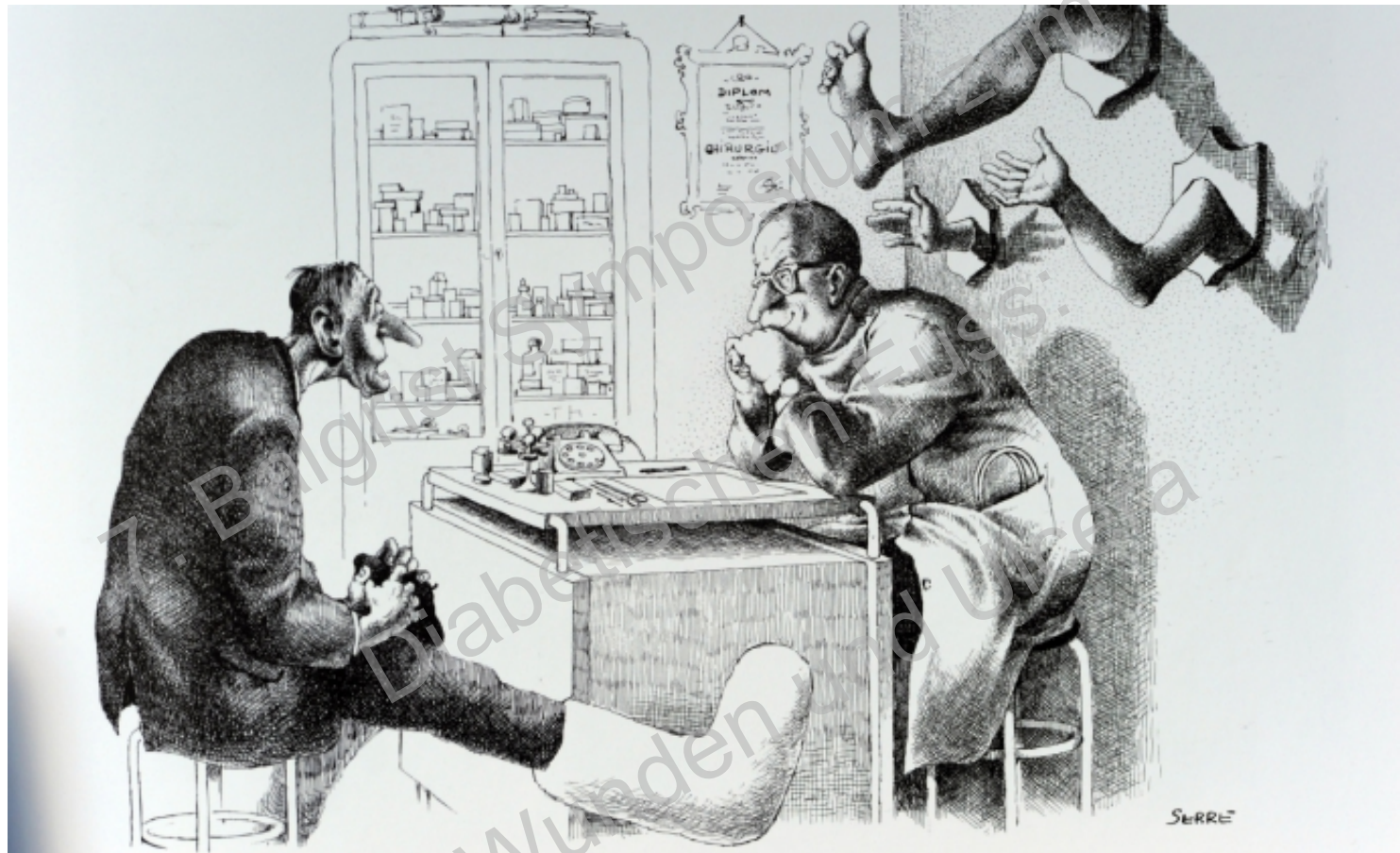
Gibbons & Freeman Treatment-induced diabetic neuropathy: a reversible painful autonomic neuropathy. *Ann Neurol* 2010; 67: 354-41.

Zusammenfassung

Diabetischer Fuss aus neurologischer Sicht:

- Large und Small Fiber NP: unterschiedliche Pathophysiologie,
- Small Fiber NP = diagnostisches Problem
- Pathophysiologie : neurovasculäres und mechanisches Micro-Trauma
- Small Fiber NP: prädiktiv für Ulcus, Amputation, Test mittels SWNF Test der Fussohle
- Risiko-Patient: > 40 Jahre, langjähriger schlecht eingestellter D.m., Übergewicht, Alkohol, Nikotin (cave: Lebensführung) ... hat: asensible diabetische Neuropathie
- → «Problem-Patienten»: Relevanz der Arzt – Patienten-Beziehung?!

Balint - Aspekt



Vielen Dank für Ihre Aufmerksamkeit