

# symptoms

## sensory disorders

|          |                    |                                |  |
|----------|--------------------|--------------------------------|--|
|          | spontaneous        | paraesthesia                   | tingling<br>burning                    |
|          | by touch, pressure | dysaesthesia                   | <b>sign</b>                            |
| pain     | continuous         |                                | boring<br>cutting<br>drawing           |
|          | paroxysmal         |                                | lancinating<br>neuralgiform            |
|          | causalgic          |                                | fluctuating, burning                   |
|          |                    | modulated by exogenous factors |  |
| numbness |                    |                                | through cellophane<br>trough cardboard |

## signs

|              |                      |   |  |
|--------------|----------------------|---|--|
| hypoesthesia |                      | hypalgesia<br>thermhypesthesia<br>pallanaesthesia                     |  |
| dysaesthesia |                      |   |  |
| allodynia    |                      | by touch  |  |
| hyperpathia  |                      | pain by touch   |  |
|              | duration<br>boundary | exceeding time of touching<br>exceeding typical region of innervation |  |
| Tinel's sign |                      | Valleix's point   |  |

ceterum

autem

censeo

# vibratory sense

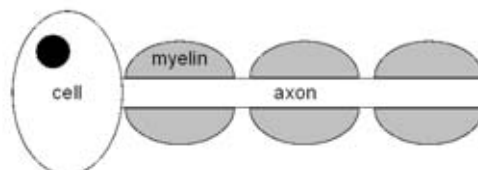
propagation of **128 Hz** through the nervous system  
excellent parameter to judge evolution of neuropathy

normal value

**8 / 8**

if diminished

- inattentive
- cerebral disorder
- skin problem
- ...
- **neuropathy**



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**Ausfallmuster**

**Nerv**

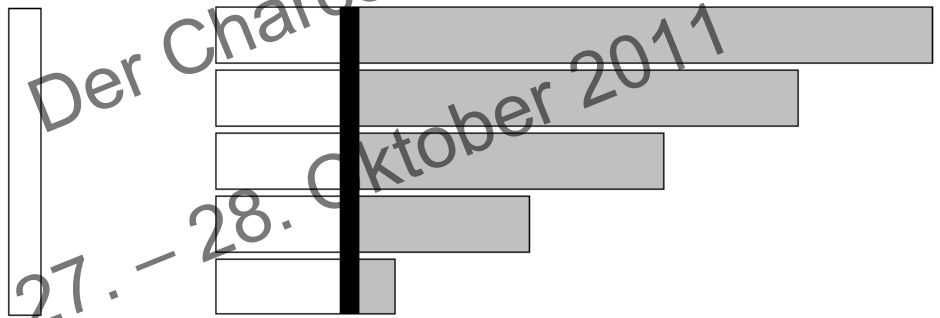
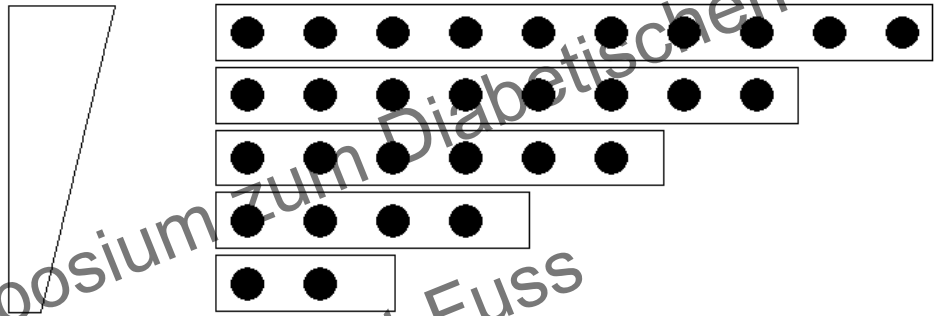
proximal

distal

neuropathisch

mononeuritisch  
vaskulär

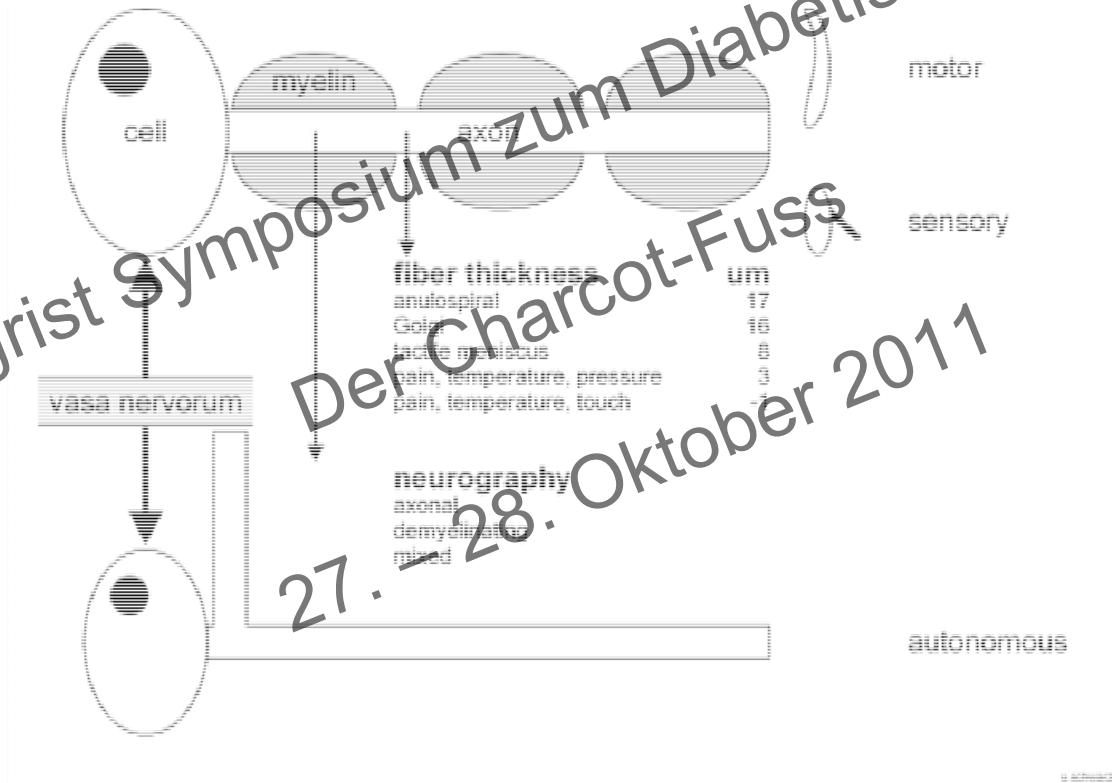
zentral



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# diabetic neuropathies

anatomy



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# diabetic neuropathies

## clinical presentation

| small-fiber np  | large-fiber np  | autonomic np  |
|---|---|---|
| burning pain + allodynia  | gnawing, dull toothache in the bones  | <b>cardiovascular</b><br>resting tachycardia<br>orthostatic hypotension<br>silent myocardial infarction     |
| later hypoalgesia   |   | <b>gastrointestinal</b><br>gastroparesis<br>diarrhea/constipation   |
| defective warm thermal sensation  | impaired vibration sensation<br>sensory ataxia<br>wasting of small muscles<br>diminished reflexes | <b>genitourinary</b><br>bladder dysfunction<br>erectile dysfunction   |
| defective autonomic function<br>decreased sweating<br>dry skin<br>impaired vasomotion | increased blood flow (hot feet)   | <b>peripheral</b><br>gustatory sweating<br>pupillary abnormalities<br>disturbed neurovascular flow<br>edema |
| remarkable intactness of tendon reflexes<br>motor strength                            | depressed tendon reflexes   | <b>metabolic</b><br>hypoglycemia<br>unawareness<br>unresponsiveness   |
| foot ulceration and gangrene  |   |   |
| <b>electrophysiologically silent</b>  |   |   |
| <b>skin biopsy</b>  |   |   |

## diabetic neuropathies

clinical presentation

|                         | <b>sensory loss</b>  | <b>motor deficit</b> | <b>tendon reflexes</b> | <b>pain</b> |
|-------------------------|----------------------|----------------------|------------------------|-------------|
| <b>large-fiber np</b>   | 0 → +++              | 0 → +++              | N → ---                | + → +++     |
| <b>small-fiber np</b>   | 0 → (+)<br>allodynia | 0                    | N → -                  | + → +++     |
| <b>prox motor np</b>    | 0 → +                | + → +++              | -                      | + → +++     |
| <b>acute mono np</b>    | 0 → +                | + → +++              | N                      | + → +++     |
| <b>pressure palsies</b> | in nerve             | + → +++              | N                      | + → ++      |

**Table 3** Symptom frequency in subjects with neuropathy

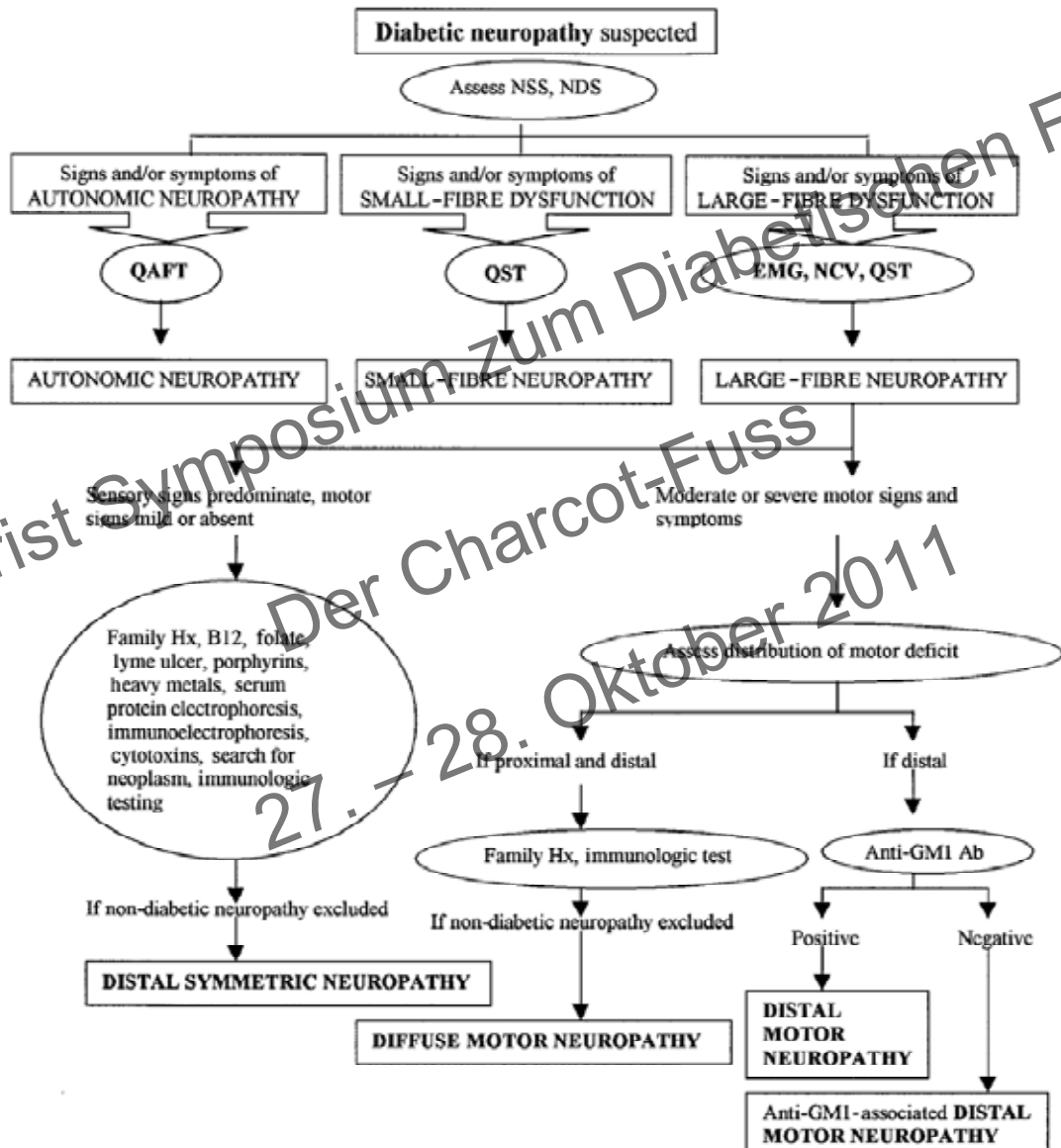
| Item  | % Affected |       | Mean TIS (SEM) |             |
|---|------------|-------|----------------|-------------|
|   | Men        | Women | Men            | Women       |
| Lightheadedness?  | 50.00      | 38.00 | 1.28 ± 0.35    | 0.96 ± 0.26 |
| Dry mouth or dry eyes?  | 77.78      | 70.83 | 1.89 ± 0.27    | 2.00 ± 0.34 |
| Feet pale or blue?  | 22.22      | 33.33 | 0.50 ± 0.23    | 0.83 ± 0.28 |
| Feet colder than the rest of your body?                             | 66.67      | 70.83 | 2.28 ± 0.44    | 2.26 ± 0.34 |
| Sweating in your feet decreased compared to the rest of your body?  | 33.33      | 25.00 | 1.00 ± 0.39    | 0.50 ± 0.23 |
| Sweating in your feet decreased or absent (exercise/hot weather)?   | 16.67      | 20.83 | 0.44 ± 0.29    | 0.50 ± 0.25 |
| Sweating in your hands increased compared to the rest of your body? | 5.56       | 20.83 | 0.28 ± 0.12    | 0.38 ± 0.17 |
| Nausea, vomiting, or bloating after eating a small meal?            | 5.56       | 16.67 | 0.06 ± 0.02    | 0.50 ± 0.26 |
| Persistent diarrhea?  | 5.56       | 16.67 | 0.28 ± 0.15    | 0.26 ± 0.16 |
| Persistent constipation?  | 11.11      | 25.00 | 0.17 ± 0.09    | 1.00 ± 0.36 |
| Leaking of urine?   | 22.22      | 45.83 | 0.67 ± 0.33    | 1.14 ± 0.33 |
| Difficulty obtaining an erection (men)?                             | 55.56      | NA    | 1.82 ± 0.48    | NA          |

Abbreviations: NA = not available; TIS = total symptom impact score.



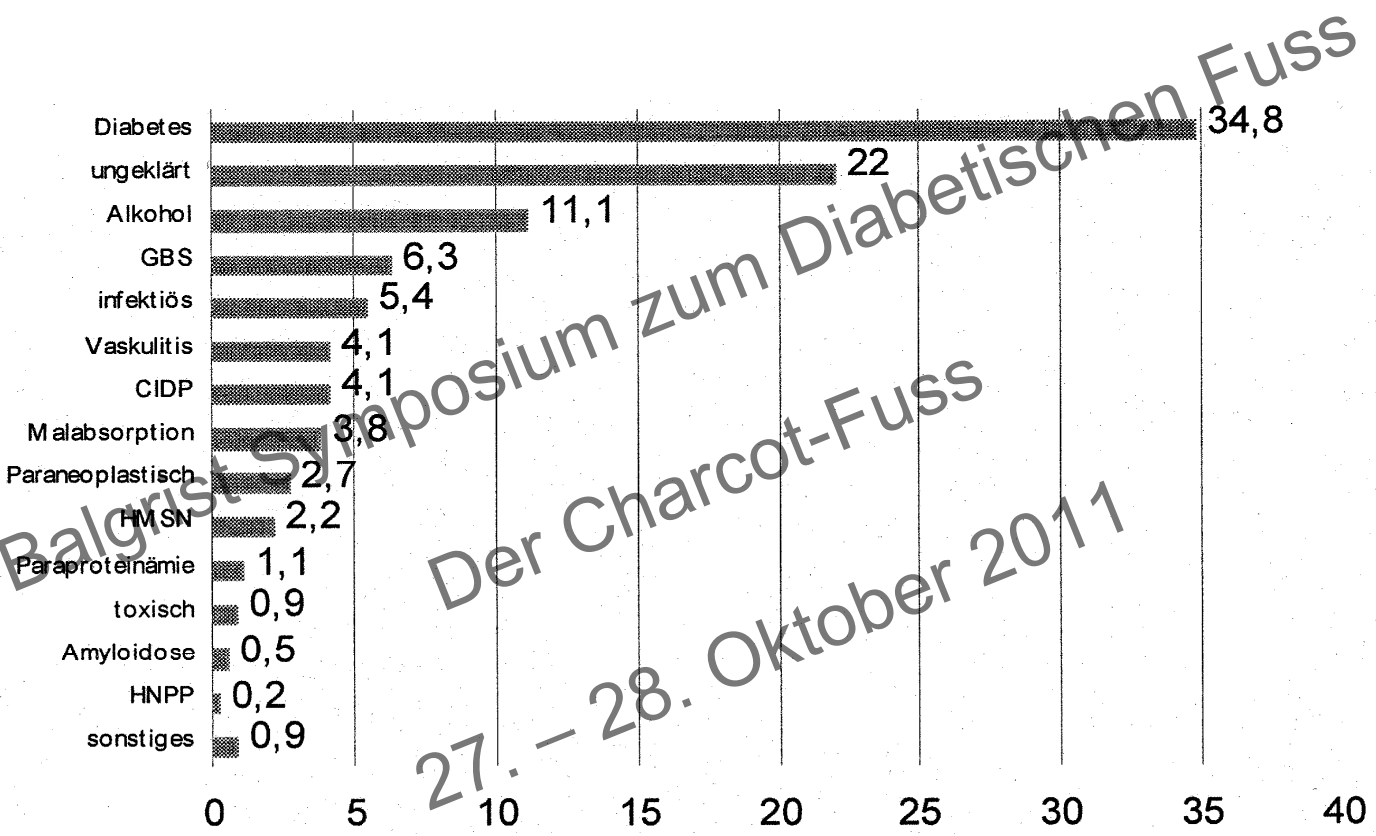
# diabetic neuropathies

assessment of neurologic deficit and classification of neuropathic syndromes



NDS neuropathic disability score  
 NSS neuropathic symptom score  
 QAFT quantitative autonomic function test  
 QST quantitative sensory testing

# 1195 Patienten mit Polyneuropathie Häufigkeitsverteilung der Aetiologie



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## evaluation

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the following are useful only in selected individuals,  
based on

- history
- examination
- electrodiagnostic features
- initial laboratory results

anti-nerve antibodies

- GM1      multifocal motor neuropathy
- MAG      IgM gammopathy
- GQ1b     Miller Fisher syndrome
- Hu        ataxic sensory neuro(no)pathy  
(elderly)

cerebrospinal fluid

- demyelinating / infectious neuropathy

skin biopsy

- small-fiber neuropathy

sural nerve biopsy

- vasculitic neuropathy

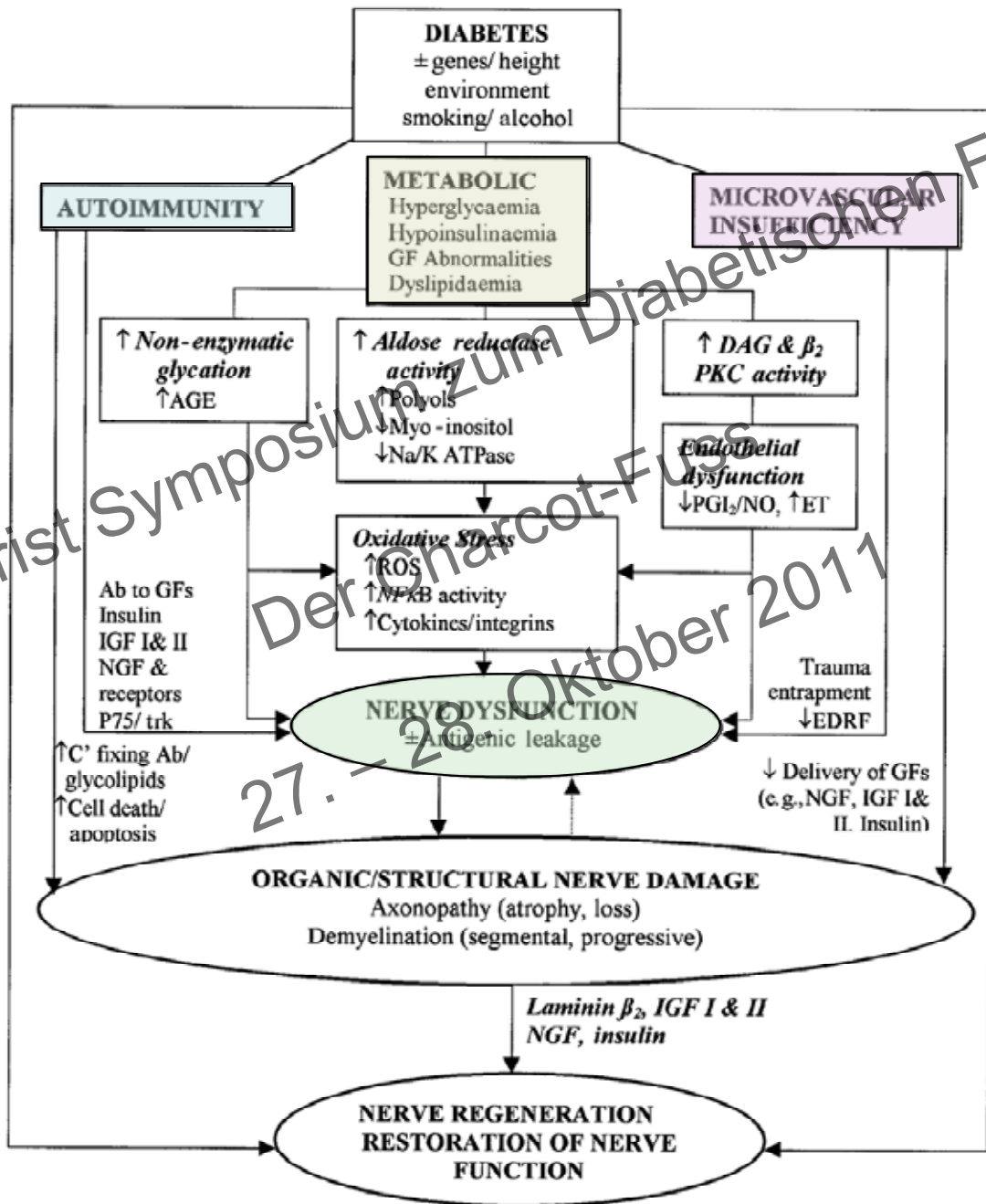
genetic tests

the contribution of invasive procedures

**~15%**

# diabetic neuropathies

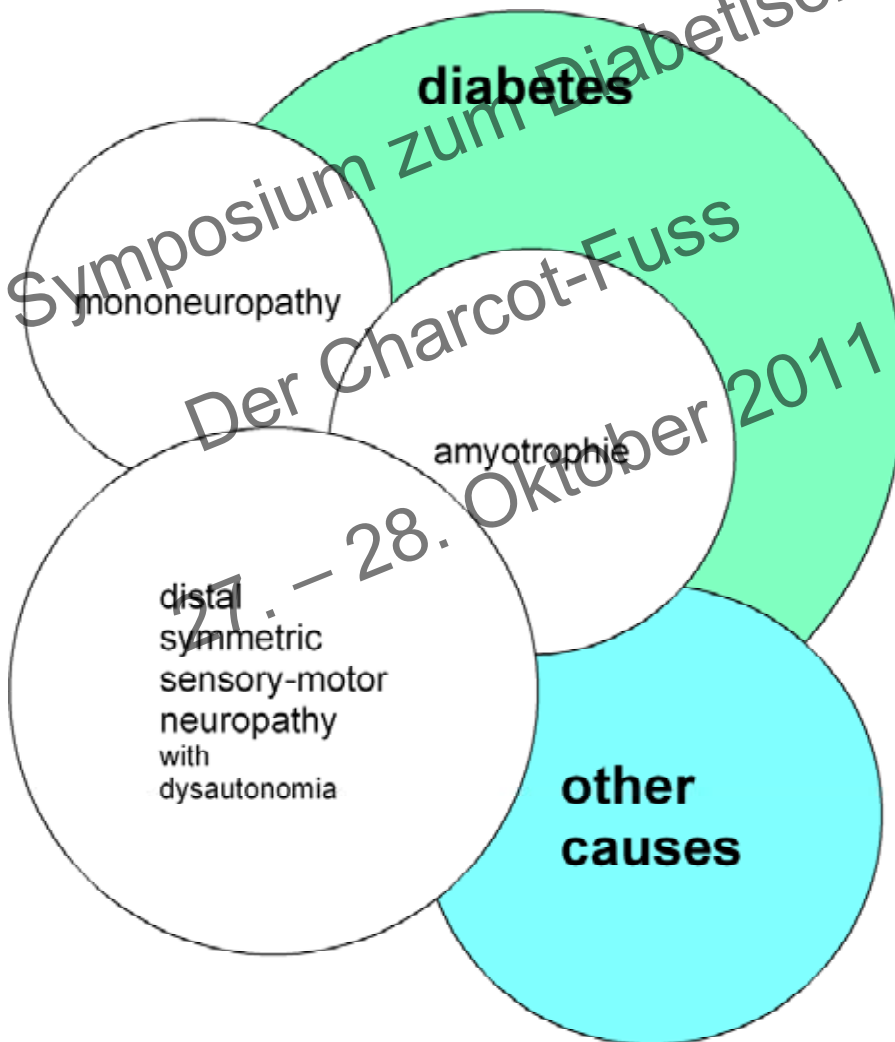
theoretical pathophysiologic framework



# diabetic neuropathies

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the patient typically presents with an individual pattern of various neuropathic syndromes  
in addition, other causes may further complicate the clinical picture

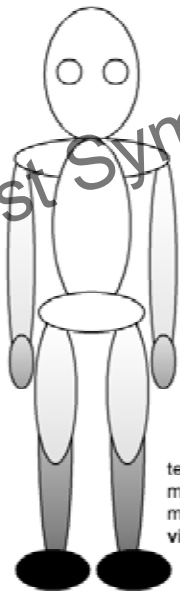


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# diabetic neuropathies

## clinical presentation

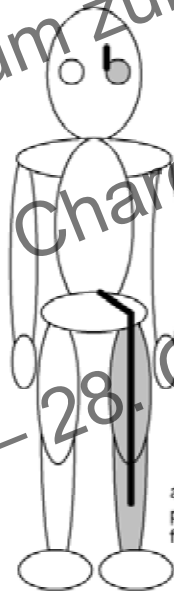
distal  
symmetric  
sensory-motor  
neuropathies



tendon reflexes ---  
myatrophy  
muscle weakness  
vibratory sense ---

autonomic neuropathy  
osteoarthopathy

acute  
multiple  
mono neuropathies



acute onset  
painful  
fasciculations

pressure  
palsies



gnawing pain  
tendon reflexes n/  
myatrophy  
muscle weakness  
no sensory loss  
rarely:  
pos Babinski sign

painful  
proximal asymmetric  
myatrophy

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# diabetic neuropathies

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management of

## small-fiber neuropathies

- Patients must be instructed on foot care with daily foot inspection
- They must have a mirror in the bathroom for inspection of the soles of the feet
- Providing patients with a monofilament for self-testing reduces ulcers
- All diabetes patients should wear padded socks
- Shoes must fit well with adequate support and must be inspected for the presence of foreign bodies (e. g. nails, pins, teeth etc) before dressing, i. e. examine the feet and the shoes daily
- Patients must exercise care with exposure to heat (no falling asleep in front of fires)
- Emollient creams should be used for the drying and cracking
- After bathing feet should be thoroughly dried and powdered between the toes
- Nails should be cut transversely, preferably by a chiropodist

## large-fiber neuropathies

- Gait and strength training
- Pain management
- Orthotics should be fitted with proper shoes for the deformities
- Tendon lengthening for Achilles tendon shortening
- Bisphosphonates can be given for osteopenia
- Surgical reconstruction and full length casting as necessary

**diabetic neuropathies**

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treatment



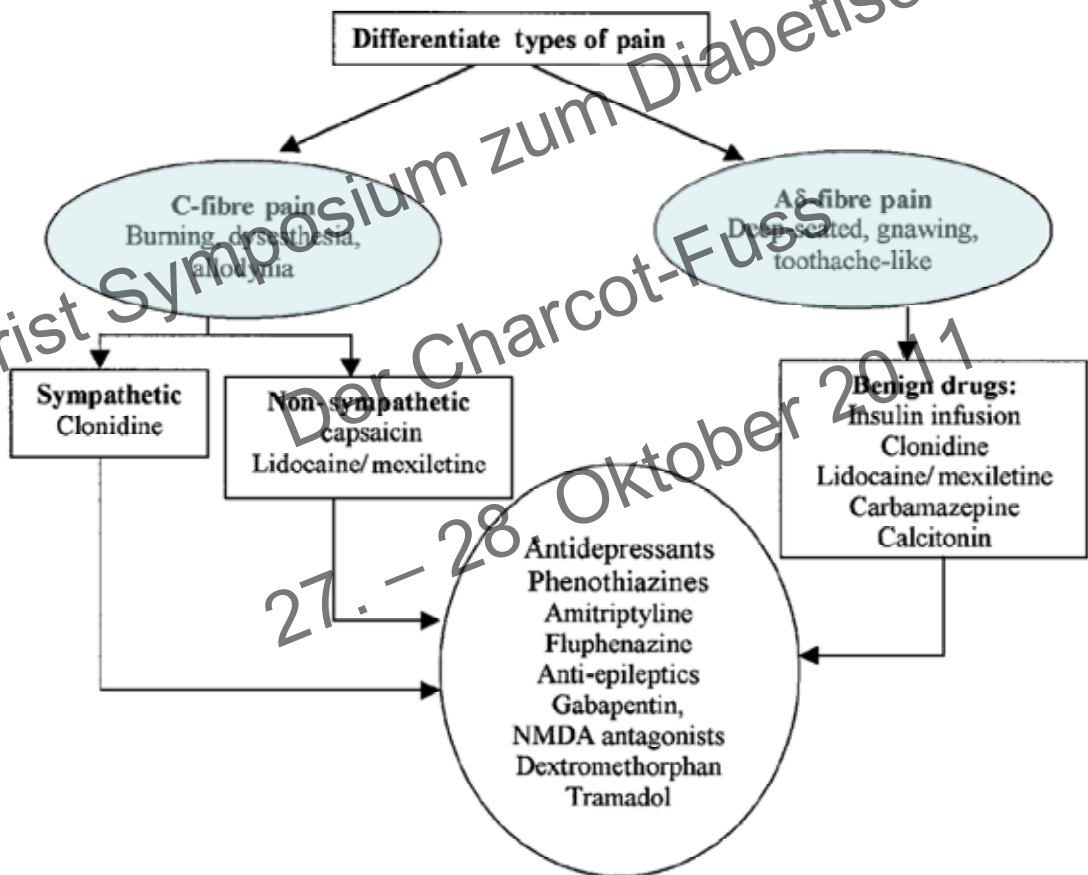
medication



# diabetic neuropathies

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management of painful diabetic neuropathy



# diabetic neuropathies

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treatment

cause

- best possible treatment of diabetes
- remove additional toxins (alcohol)
- supply vitamins

alternatives

- comfortable shoes
- local application of cold or warmth
- Transcutaneous Electrical Nerve Stimulation

medication

- primarily as monotherapy
- try at least for 4 weeks before judging efficacy

# NEUROLOGY

**Evidence-based guideline: Treatment of painful diabetic neuropathy : Report of the American Academy of Neurology, the American Association of Neuromuscular and Electrodiagnostic Medicine, and the American Academy of Physical Medicine and Rehabilitation**

V. Bril, J. England, G.M. Franklin, et al.

*Neurology*; Prepublished online April 11, 2011;

DOI 10.1212/WNL.0b013e3182166ebe

time frame 1960 - 2008

studies 2234 > 463

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**Table 1** Summary of recommendations

|         | Recommended drug and dose   | Not recommended             |
|---------|---|-----------------------------|
| Level A | Pregabalin, 300-600 mg/d <b>LYRICA</b>                            |                             |
| Level B | Gabapentin, 900-3,600 mg/d  | Oxcarbazepine               |
|         | Sodium valproate, 500-1,200 mg/d                                  | Lamotrigine                 |
|         | Venlafaxine, 75-225 mg/d  | Lacosamide                  |
|         | Duloxetine, 60-120 mg/d   | Clonidine                   |
|         | Amitriptyline, 25-100 mg/d  | Pentoxifylline              |
|         | Dextromethorphan, 400 mg/d  | Mexifetine                  |
|         | Morphine sulphate, titrated to 120 mg/d                           | Magnetic field treatment    |
|         | Tramadol, 210 mg/d  | Low-intensity laser therapy |
|         | Oxycodone, mean 37 mg/d, max 120 mg/d                             | Reiki therapy               |
|         | Capsaicin, 0.075% QID   |                             |
|         | Isosorbide dinitrate spray  |                             |
|         | Electrical stimulation, percutaneous nerve stimulation ×3-4 weeks |                             |

### Kosten

Lyrica 300mg: 168 = 458.25 -> 5.50/d -> 2000/a  
 Tegretol 400mg: 200 = 77.85 -> 1.20/d -> 420/a

# diabetic neuropathies

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adverse effects of treatment

tricyclic antidepressants

- anticholinergic
- arrhythmia
- body weight

SSRI antidepressants

- dizziness
- nausea
- sexual dysfunctions

antiepileptics

- dizziness
- nausea
- withdrawal symptoms
- confusional state
- exanthema
- liver disorders
- kidney stones

opiate

opioids

- dependence

topic

- initially painful