Diabetic Neuropathy
Identification and Management

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Capital Nursing Education
Objectives

Understand 🧐
Understand the different types of Neuropathies

Learn 🤓
Learn ways to possibly prevent neuropathies in type 1 and type 2 diabetics

Explore 🧐
Explore neurological assessment techniques

Identify 🚔
Identify types of patients who may suffer from neuropathies
### Terms Used

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>DN</td>
<td>Diabetic Neuropathy</td>
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<tr>
<td>DPN</td>
<td>Diabetic peripheral neuropathy</td>
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<tr>
<td>DSPN</td>
<td>Diabetic sensorimotor polyneuropathy <em>(most common)</em></td>
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<tr>
<td>DNP</td>
<td>Diabetic Neuropathy Pain</td>
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<tr>
<td>IENFD</td>
<td>Intra-epidermal nerve fiber density</td>
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<tr>
<td>SFN</td>
<td>Small fiber neuropathy</td>
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<tr>
<td>CCM</td>
<td>Corneal confocal microscopy</td>
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<tr>
<td>CAN</td>
<td>Cardiovascular autonomic neuropathy</td>
</tr>
<tr>
<td>DAN</td>
<td>Diabetic Autonomic Neuropathy</td>
</tr>
</tbody>
</table>
Up to 50% of people with Diabetes have Neuropathy

Associated with increased mortality - leads to morbidity

Up to 50% of patients with DPN suffer with painful symptoms

Prevalence of Diabetes, DPN, and foot amputations continue to increase at an alarming rate.
Different Types Of Neuropathy

There are four types of diabetic neuropathy:

- Peripheral Neuropathy (Also Called Diabetic Nerve Pain And Distal Polyneuropathy)
- Proximal Neuropathy (Also Called Diabetic Amyotrophy)
- Autonomic neuropathy.
- Focal neuropathy (also called mononeuropathy)
Charcot’s Joint
Neuropathic Arthropathy

Foot breaks down because of a problem with nerves

Typical case—loss of sensation, unable to feel pain in foot, muscles lose ability to support joint

Foot unstable and walking makes it worse
Cranial Neuropathy

Affects the 12 pairs of nerves that control sight, eye movement, hearing and taste.
Compression Mononeuropathy

- Single Nerve Is Damaged
- Fairly Common
- Carpal tunnel syndrome is most common compression mononeuropathy
Femoral Neuropathy

- Most often in type 2 diabetics
- Pain in front of one thigh
- Affected muscles waste away
Diabetic Amyotrophy

- Weakness on both sides of body
- May or may not have pain
- Unknown cause
- May be blood vessel disease but unsure
Thoracic/Lumbar Radiculopathy

- Another common mononeuropathy
- Like femoral neuropathy, but occurs in the torso
Classification for Diabetic Neuropathies

**Diffuse Neuropathy**
DSPN -- Diabetic Sensorimotor Polyneuropathy
Autonomic
Sudomotor Dysfunction
Hypoglycemia Unawareness
Abnormal Pupillary Function

**Mononeuropathy (Mononeuritis Multiplex) (Atypical Forms)**
Isolated Cranial Or Peripheral Nerve
Mononeuritis Multiplex

**Radiculopathy Or Polyradiculopathy (Atypical Forms)**
Radiculoplexus Neuropathy
Thoracic Radiculopathy
Mononeuropathy (mononeuritis multiplex) (atypical forms)

Isolated cranial or peripheral nerve (e.g., CN III, ulnar, median, femoral, peroneal)

Mononeuritis multiplex (if confluent may resemble polyneuropathy)

Types of Peripheral Neuropathy

- Mononeuropathy
- Polyneuropathy
- Mononeuropathy Multiplex
Radiculopathy or Polyradiculopathy (Atypical Forms)

- Radiculoplexus neuropathy (lumbosacral polyradiculopathy, proximal motor amyotrophic)
- Thoracic radiculopathy
Nondiabetic Neuropathies Common In Diabetes

- Pressure palsies
- Demyelinating polyneuropathy
- Radiculoplexus neuropathy
- Acute painful small fiber neuropathies (treatment-induced)
Diffuse Neuropathy

DSPN

- Distal Symmetric Polyneuropathy
- Primarily Small-fiber Neuropathy
- Primarily Large-fiber Neuropathy
- Mixed Small And Large Fiber Neuropathy (Most Common) Autonomic

Because of the prevalence of DSPN being so much higher, we will concentrate on that type and not go into the mononeuropathy or radiculopathy due to time constraints.
Diffuse Neuropathy

Cardiovascular
Reduced HR, Resting Tachycardia, Orthostatic Hypotension, Sudden Death (Malignant Arrhythmia)

Gastrointestinal
Diabetic Gastroparesis; Diabetic Enteropathy (Diarrhea); Colonic Hypomotility (Constipation)

Urogenital
Diabetic Cystopathy (Neurogenic Bladder), Erectile Dysfunction, Female Sexual Dysfunction

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Diffuse Neuropathy
Autonomic Cardiovascular—
CAN in Diabetics

CAN is a very serious complication of diabetes

CAN may be frequently detected and adequately managed in early stages

Autonomic dysfunction may also be found in absence of DM due to CAD and MI
Diffuse Neuropathy
Autonomic Cardiovascular

- 73 diabetic adults had Symptomatic autonomic neuropathy and ECG evidence of MI
- 25 (34.2%) demonstrated CAN
- 10 (13.7%) had ECG evidence of MI
- 7 patients were asymptomatic by history (silent MI)
Clinical Features of CAN

- Resting Tachycardia
- Fixed Heart Rate In Advanced
- Postural Hypotension
- Weakness, Dizziness, Visual Impairment, Syncope
- Exercise Intolerance
- Left Ventricular Diastolic Function Abnormalities
- Silent Myocardial Infarction
- Perioperative Instability
- Abnormal Hormonal Regulation
Treatment of CAN

- Glycemic Control
- May need low dose cardio selective Beta-Adrenoceptor Blocking Agents
- Moderate exercise
- Head up bed position during sleeping
- Sitting on edge of bed prior to getting up
Prognosis Of Patients With CAN

Studies show an increased mortality in patients with symptomatic CAN
Prevention Of CAN

- Glucose control
- Lifestyle modifications
Gastroparesis
- Feel full
- Abdominal fullness
- Nausea and vomiting
- Diarrhea, incontinence and constipation

Diffuse Neuropathy
Autonomic Gastrointestinal

Gastroparesis
- Weak 3 cpm rhythm
- Gastric dysrhythmias
- Tachygastria
- Bradygastria
- Pylorospasm
- Dilated gastric antrum
- Antral hypomotility
- Gastroparesis
Diffuse Neuropathy
Autonomic Urogenital

Neurogenic bladder (cystopathy)
Diffuse Neuropathy continued

• Sudomotor dysfunction
  - Distal hypohydrosis / anhydrosis
  - Gustatory sweating
  - Sweat and become red in the face while eating
  - Can lead to Frey’s syndrome
  - Parotid gland problems

• Hypoglycemia unawareness
• Abnormal pupillary function
Sudomotor Dysfunction

Common feature of diabetic autonomic neuropathy

Symptoms- orthostatic hypotension

Exercise intolerance

Sweating abnormalities
Sudoscan

- Noninvasive/painless
- Electrodes for hands and feet
- Analyzed on computer
- Measured in ESC (micro Siemens)
- ESC composite score ranges from 0-150
Hypoglycemia Unawareness

- Can be caused by nerve damage
- It is reversible by avoidance of hypoglycemia for 7-21 days
Abnormal Pupillary Function

- Reduced response to light
- Early sign of development of systemic autonomic neuropathy
- The duration of diabetes and the development of systemic autonomic dysfunction are related
Glucose Control As Related To DSPN

Type 1
Dramatically Reduces The Incidence Of DSPN (78% Relative Risk Reduction)

Type 2
Modestly Reduces The Risk Of Developing DSPN (5-9% Relative Risk Reduction)
Glucose Control as related to CAN

Type 1
Reduced risk of CAN by 45%

Type 2
Reduced the risk of CAN by 60%
Lifestyle Modifications

- Diabetes Prevention Program (DPP)
- Steno-2 Study
- Italian supervised treadmill study
- University of Utah type 2 diabetes study
Screening And Diagnosis Recommendations

Up To 50% of patients may have symptoms but the rest are asymptomatic. Patients may not volunteer symptoms but when asked, may reveal that they have numbness or other positive symptoms of DSPN.

Consider screening patient with prediabetes and patients with any type of wound on their feet.

**Type 1**
Assess at diagnosis and at least annually thereafter

**Type 2**
Assess for DSPN at diagnosis and 5 years after diagnosis
To Document the presence of symptoms for diagnosis; Documented in symmetrical, distal to proximal pattern

<table>
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<tr>
<th>Function</th>
<th>Large myelinated nerve fibers</th>
<th>Small myelinated nerve fibers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure, balance</td>
<td></td>
<td>Proprioception, protective sensation</td>
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<table>
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<tr>
<th>Symptoms</th>
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<tr>
<td>Numbness, tingling, poor balance</td>
<td>Pain: burning, electric shocks, stabbing</td>
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<th>Examination (clinically diagnostic)</th>
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<td>Ankle reflexes: reduced/absent</td>
<td></td>
<td>Thermal (cold/hot) discrimination: reduced/absent</td>
</tr>
<tr>
<td>Vibration perception: reduced/absent</td>
<td></td>
<td>Pinprick sensation: reduced/absent</td>
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<tr>
<td>10-g monofilament: reduced/absent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proprioception: reduced/absent</td>
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Most common early symptoms are involvement of small fibers—pain and sensations of burning.

May have burning, lancinating, tingling or shooting (electric shock-like) with paresthesia.

Usually worse at night.

May be evoked by contact (socks shoes etc.).

Can lead to decrease in activities, disability, psychosocial impairment, reduced health related quality of life.
Symptoms of Large Fiber Involvement

- Most common early symptoms are involvement of small fibers—pain and sensations of burning
- May have burning, lancinating, tingling or shooting (electric shock-like) with paresthesia
- Usually worse at night
- May be evoked by contact (socks shoes etc.)
- Can lead to decrease in activities, disability, psychosocial impairment, reduced health related quality of life

- Numbness
- Tingling with out pain
- Loss of protective sensation (high risk for DFU)
- Feels like “feet wrapped in wool”
- No pain is what permits these people to walk on lesions, inducing chronicity, which frequently is complicated by infection
Symptoms of Small and Large Fiber Involvement

Distal symmetric diabetic neuropathies: subtypes

- **Large-fiber**
  - Deep-seated pain (A-δ type)
  - Wasting and weakness
  - Numbness, pins and needles, tingling, ataxia
  - Impaired vibration perception
  - Loss of position sense
  - Loss of reflexes
  - Impaired nerve conduction velocity
  - Interferes with normal life
  - Risk of falling and fractures

- **Small-fiber**
  - Superficial pain (C-fiber type)
  - Electric shock, burning, allodynia
  - Autonomic dysfunction
  - Thermal imperception
  - Normal strength and reflexes
  - Electrophysiologically silent
  - Quantitative sensory testing and skin biopsies
  - Produces symptoms
  - Leads to morbidity and mortality

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Testing Methods

- Small fiber function:
- Pin prick and touch test
- Large fiber function:
- Vibration perception, (128-Hz tuning fork)
- Proprioception
- 10g monofilament to test their sensation or lack thereof
- Ankle reflexes
Pin Prick and Touch Test

- Pin Prick is used to locate a focal area of sensory loss
- Highly subjective
- Concern for sterility and inadvertent skin puncture
- Ipswich Touch Test (IpTT)
- Touch first, third, and fifth toes with index finger for 1-2 seconds
- Avoid pushing or tapping
- Identification of 2 or more insensate areas is considered a positive result
The Semmes-Weinstein Monofilament Test

- Introduced in 1899 by Max Von Frey
- Non-invasive
- Inexpensive
- Must do a series of random applications to minimize guessing
Vibratory Sensation

- 128-Hz tuning fork at interphalangeal joint of hallux
- May allow early detection of sensory neuropathy or, lack of protective sensation
- Tests the thickly myelinated fibers
Reflex Testing

➢ Screens for sensory neuropathy

➢ Focuses on ankle reflex

➢ Clinician aligns the ankle to neutral and strikes the Achilles tendon with neurological hammer

➢ Abnormal is absence of ankle plantarflexion
Quick and Easy Assessment Tool

- Non-painful gait with foot deformity or ulceration

- 0-2 grade scale used as clinical guideline for anesthesia requirements for local wound care or debridement

- 0 is total absence of sensation

- 1 is impaired perception of pain

- 2 is normal sensation
Prevention Of Symptomatic Diabetic Neuropathy

- Glycemic Control
- Foot Care
- Safety and Falls

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Relieving the Pain

- Anti-seizure drugs
- Antidepressants
- Acetaminophen or ibuprofen
- Skin patch with lidocaine
Managing Complications and Restoring Function

- Urinary tract problems
- Digestive problems
- Orthostatic hypotension
- Sexual Dysfunction
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Brief report Gustatory sweating and diabetes

Author links open overlay panel

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