



# Evaluation and Screening of Diabetic Foot

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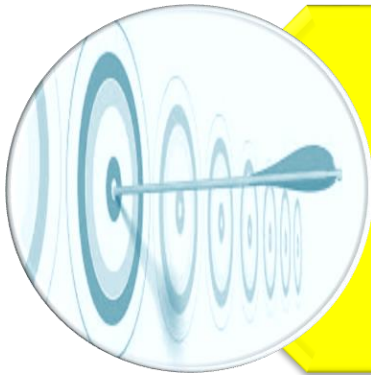
# Outline

- Taking History
- Physical Examination
- Inspection
- Neurological Assessment
- Vascular Assessment



# Taking History

# The importance of good history taking



Relevant diagnostic testing  
timely and accurate diagnosis



Prevent unnecessary testing  
cost-effective

# What is a medical history?

**Chief complaint**

**Current Medications**

**Known Allergies**

**Past and Present Illnesses**

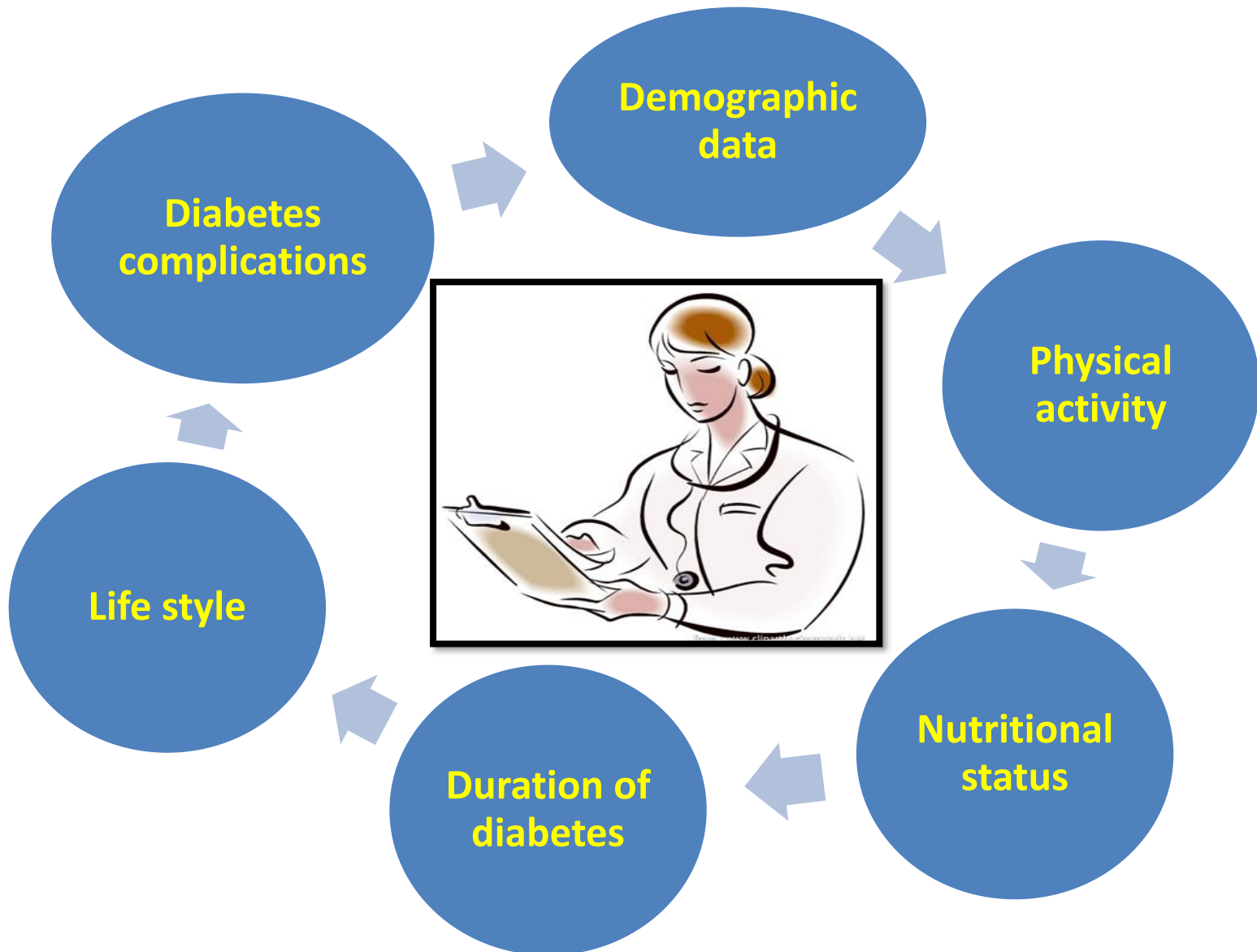
**Medication History**

**Previous Surgeries**

**Previous Hospitalizations**

**Family Medical History**

# Medical History and Diabetes





**Diabetic  
Patients Foot  
Evaluation**



# Basic Foot Assessment Checklist

**1. Ask the patient**

neuropathic symptoms	Y	N
rest pain	Y	N
intermittent claudication	Y	N
previous foot ulcer	Y	N
amputation	Y	N

specify SITE \_\_\_\_\_ DATE \_\_\_\_/\_\_\_\_/\_\_\_\_

**2. Look at both feet**

infection	Y	N
ulceration	Y	N
calluses or corns	Y	N
skin breaks	Y	N
nail disorders	Y	N

		LEFT		RIGHT	
		Y	N	Y	N
<b>3. Check foot pulses</b>	Dorsalis pedis	Y	N	Y	N
	Posterior tibial	Y	N	Y	N

		LEFT		RIGHT	
		Y	N	Y	N
<b>4. Test for neuropathy</b>	Monofilament *	Y	N	Y	N

\*detected at sites marked



**5. Assess footwear**

style	Good	Poor
condition	Good	Poor
fit	Good	Poor

**6. Assess education need**

Does the patient understand the effects of diabetes on foot health?	Y	N
Can the patient identify appropriate foot care practices?	Y	N
Are the patient's feet adequately cared for?	Y	N

**7. Assess self care capacity**

Does the patient have impaired vision?	Y	N
Can the patient reach down for safe self care?	Y	N
Are there other factors influencing ability to safely care for own feet?	Y	N

**All people with diabetes need to have their feet assessed with these 7 simple steps every 6 months or more often if problems are identified**



# Key components of the diabetic foot exam

## Inspection

### Dermatologic

Skin status: color, thickness, dryness, cracking

Sweating

Infection: check between toes for fungal infection

Ulceration

Calluses/blistering: hemorrhage into callus?

### Musculoskeletal

Deformity, eg, claw toes, prominent metatarsal heads, Charcot joint

Muscle wasting (guttering between metatarsals)

## Neurological assessment

**10-g monofilament + 1 of the following 4**

Vibration using 128-Hz tuning fork

Pinprick sensation

Ankle reflexes

VPT

## Vascular assessment

Foot pulses

ABI, if indicated



# Inspection

- Patient position during the foot examination



- Altman MI: The podiatric assessment of the diabetic lower extremity: special considerations. *Wounds* 12 (Suppl. B):64B-71B, 2000
- Boulton AJM: Pathogenesis of diabetic foot ulceration and measurements of neuropathy. *Wounds* 12 (Suppl. B):12B-18B, 2000
- Boike AM: A practical guide for examining and treating the diabetic foot. *Cleve Clin J Med* 69:342-348, 2002

# Dermatologic Assessment:

## Skin Statue

- Color
- Thickness
- Dryness
- Cracking



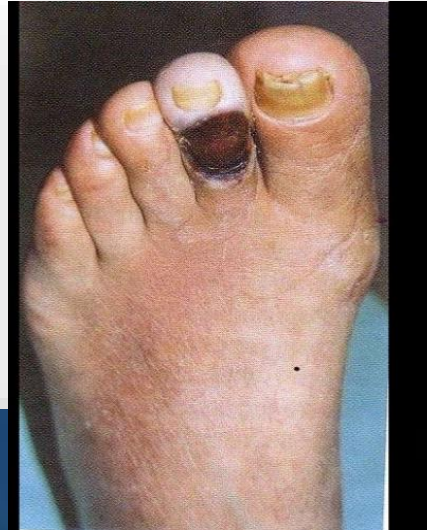
# Dermatologic Assessment:

## Fungal Infection



# Dermatologic Assessment:

## Ulceration



# Dermatologic Assessment:

## Callus



# Dermatologic Assessment:

## Corn





# Dermatologic Assessment:

## In-growing Toenails



# Dermatologic Assessment:

## Thickened Nails



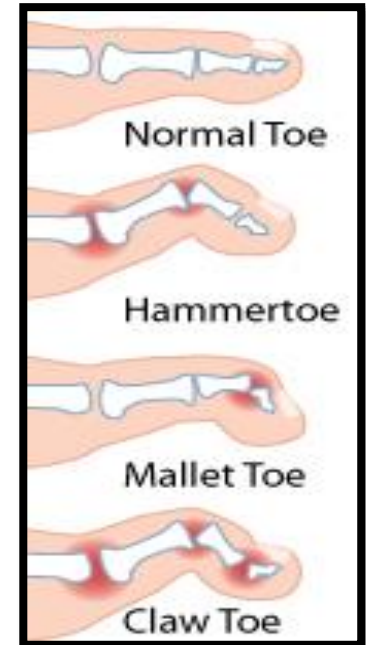
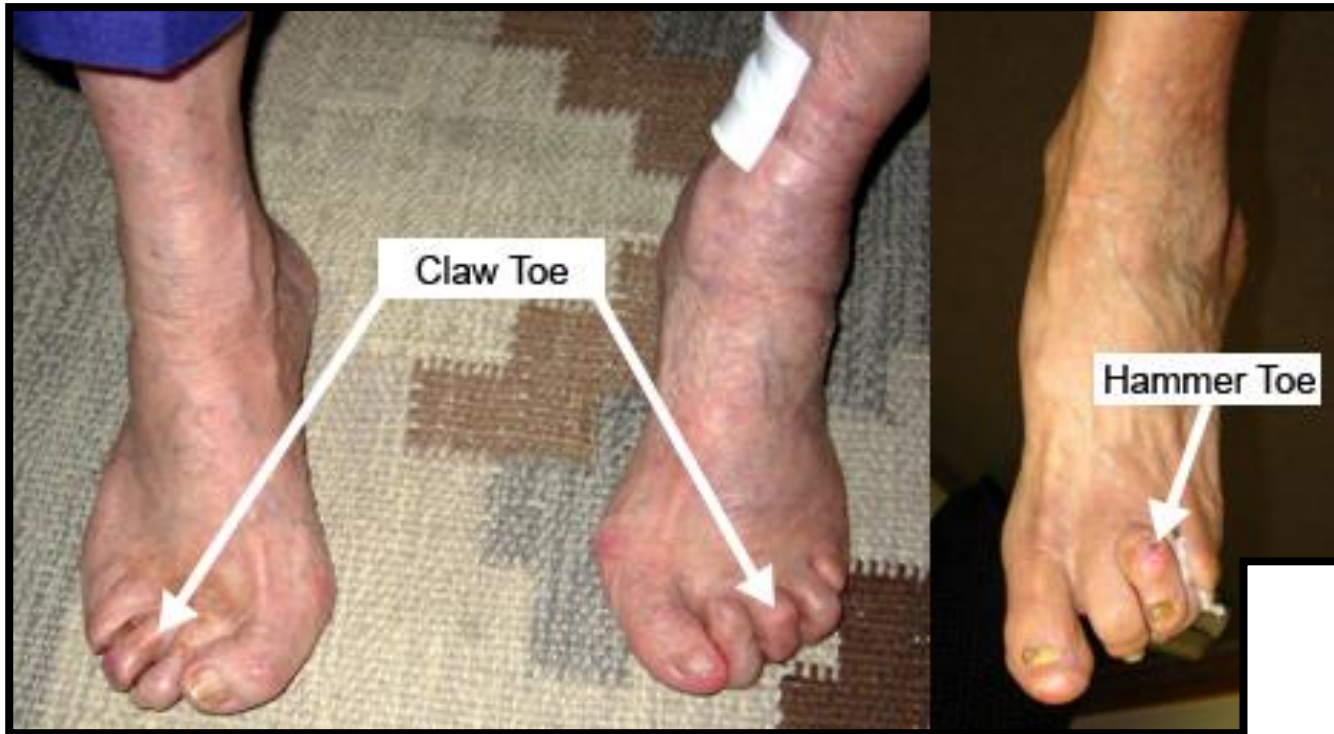
# Musculoskeletal Assessment

## Deformity



# Musculoskeletal Assessment

## Deformity



# Musculoskeletal Assessment

- Dorsiflexion and plantar flexion

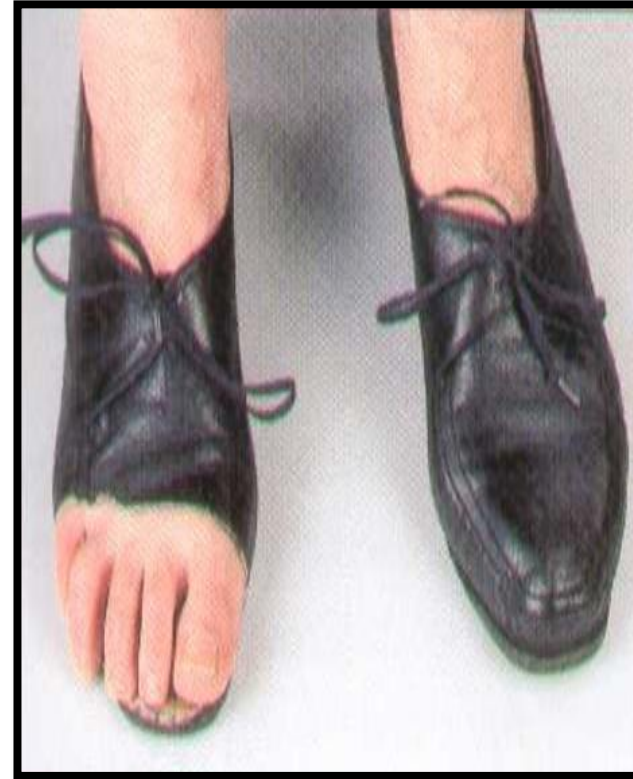
Normal range of flexion of the thumb:

In **dorsiflexion**: 45-50 °

In **plantar flexion**: 10 °



## FOOT WEAR



**What do you  
understand from  
patients foot wear?**





# Neurological Assessment



# Types of Neuropathy

- Sensory neuropathy
- Motor neuropathy

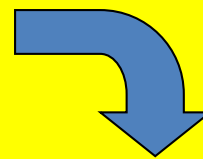


Muscle imbalances



Foot deformity

- Autonomic neuropathy



Dryness of the foot



# Sensory Neuropathy Assessment

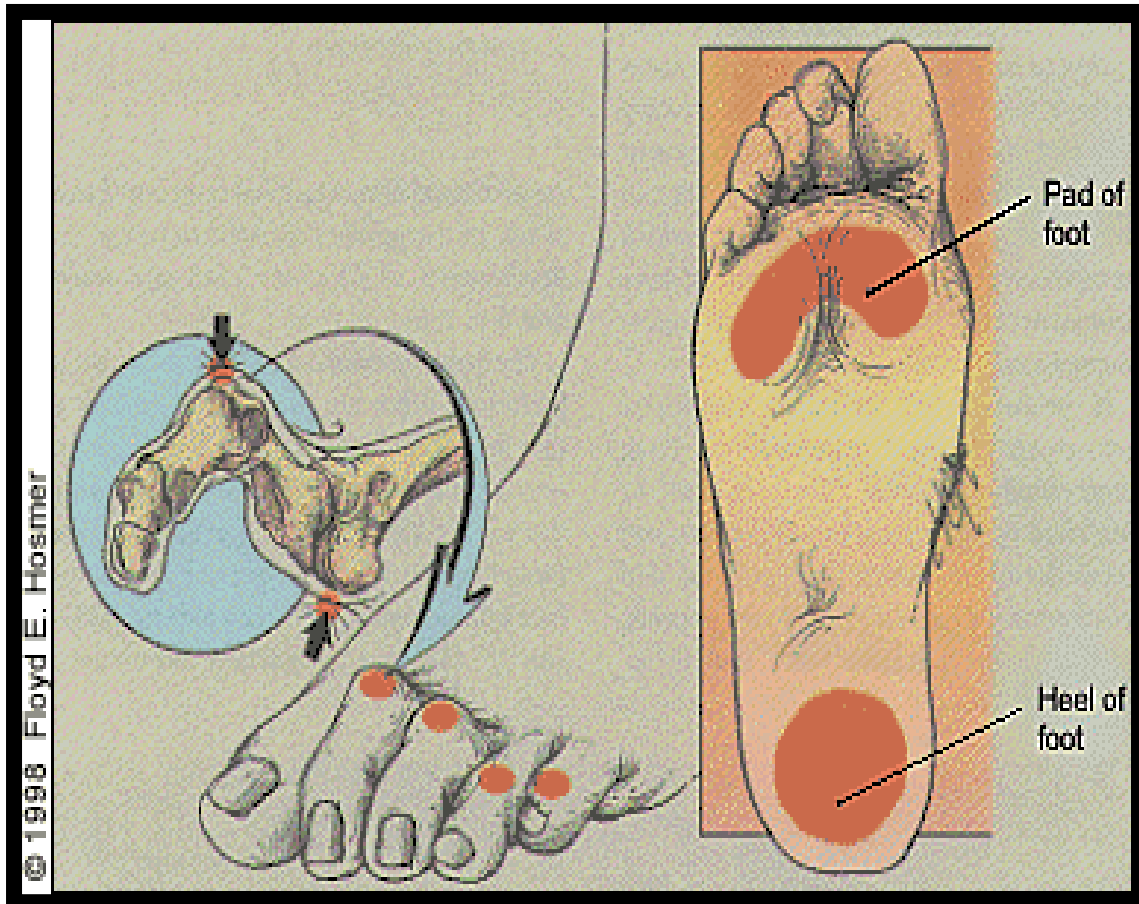
## Screening Tests for Peripheral Neuropathy

- **Pressure sensation**
- **Vibration sensation**
- **Superficial pain or temperature sensation**
- **Ankle reflex**



# Pressure sensation

# Pressure Assessment



# Pressure Assessment



# Foot Scanner

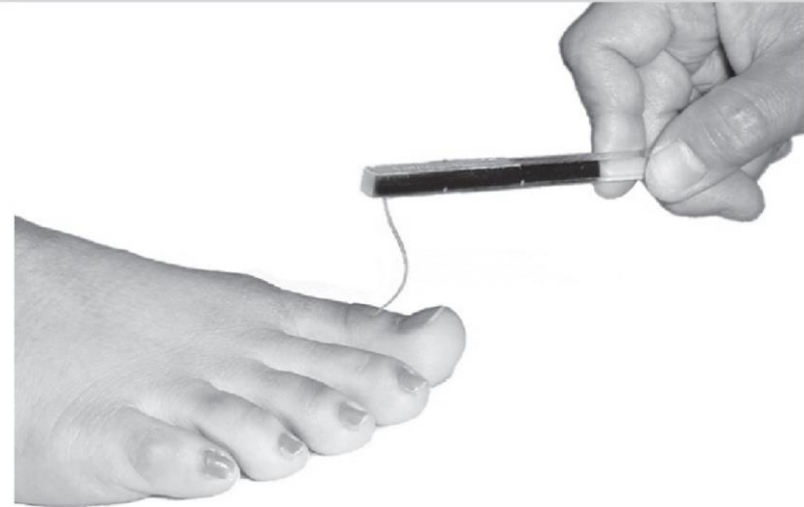
## 950 point pressure mapping



# Rapid Screening for Diabetic Neuropathy Using 10 gram Semmes-

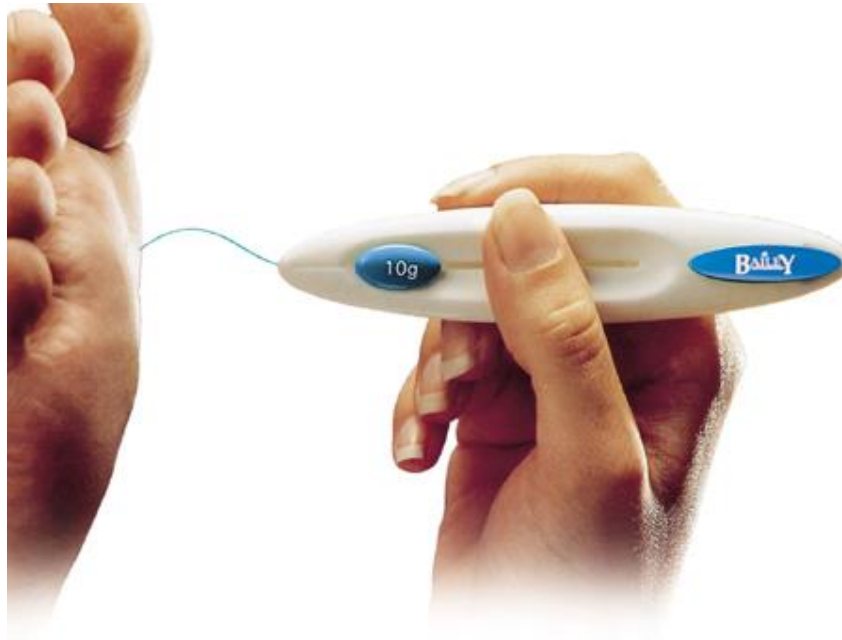
## Rapid Screening for Diabetic Neuropathy Using the 10-g Semmes-Weinstein Monofilament

1. Show the 10-g Semmes-Weinstein monofilament to the patient.
2. Touch it first to the patient's forehead or sternum so that the sensation is understood.
3. Instruct the patient to say "yes" every time the monofilament stimulus is perceived.
4. With the patient's eyes closed, apply the monofilament to the dorsum of the great toe proximal to the nail bed as shown in the illustration below. Use a smooth motion-touch the skin, bend the filament for a full second, then lift from the skin.
5. Perform this stimulus 4 times per foot in an arrhythmic manner so the patient does not anticipate when the stimulus is to be applied.
6. For each of the 8 stimuli, assign a score of 0 if it is not perceived, 0.5 if it is substantially less than that perceived on the forehead or sternum, and 1 if it is perceived normally. A score of 3 out of 8 correct responses means that the presence of neuropathy is likely. A score of 3.5 to 5 means that the risk of new onset neuropathy in the next four years is high. A score of 5.5 or greater indicates that there is a low risk of neuropathy onset in the next four years.



Loss of sensation over the distal plantar surface to the 10g monofilament is a significant and independent predictor of foot ulceration and lower-extremity amputation.

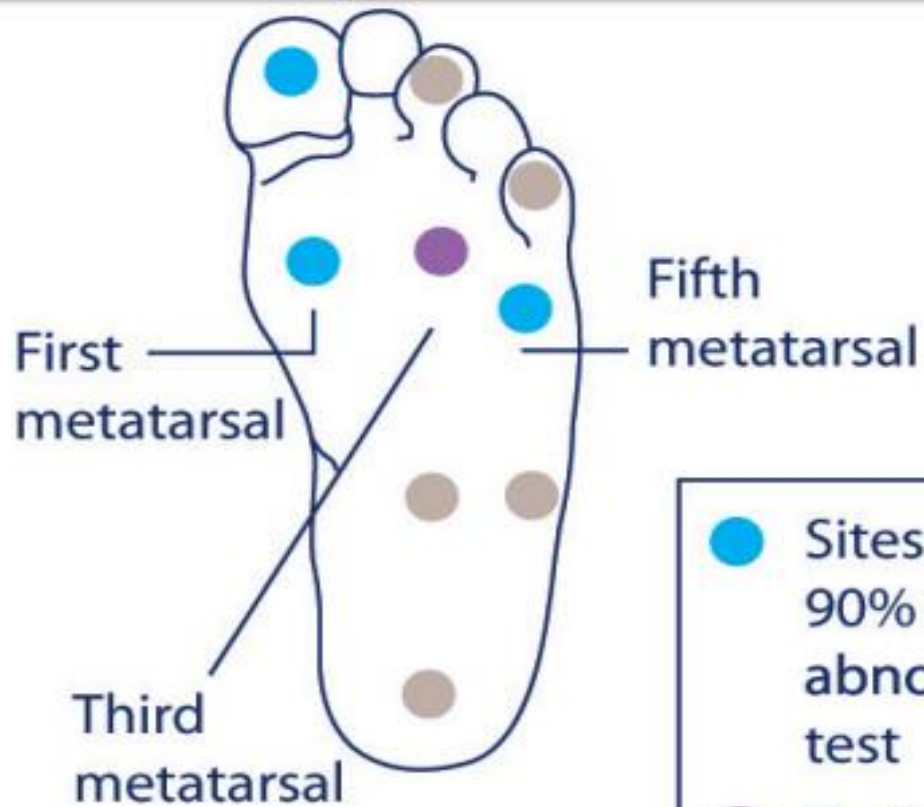
# Monofilament Examination







Using a monofilament to test for neuropathy



- Sites shown to identify 90% of patients with abnormal monofilament test
- Optional fourth site
- Other recommended sites

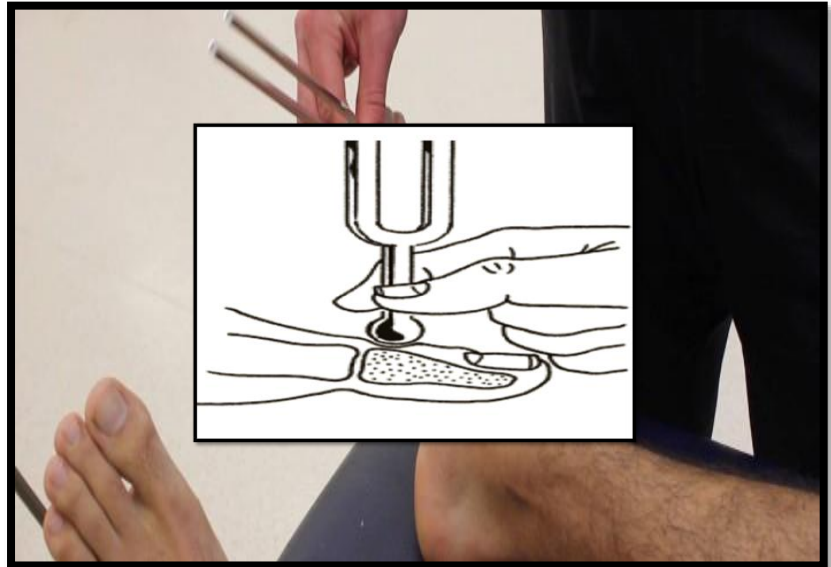


# Vibration sensation

# Examination of Vibration Perception

## Use of Tuning Fork

- Sensitivity of 53%
- Specificity of 99%



# Superficial pain Temperature sensation

# Sensory Neuropathy Assessment

Tests can be used to identify loss of protective sensation



# Sensory Neuropathy Assessment

- A cotton wool



# Sensory Neuropathy Assessment

- Neuro tip







# Assessment of Peripheral Neuropathy

- Pinprick



# Sensory Neuropathy Assessment

## IPswich



# Sensory Neuropathy Assessment

- Temperature sensation





# Ankle Reflex

# Assessment of Peripheral Neuropathy

- Absent ankle reflexes & Limited joint motion increased the risk of future foot ulcers



# Types of Neuropathy

- Sensory neuropathy
- Motor neuropathy

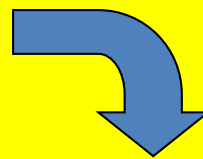


Muscle imbalances



Foot deformity

- Autonomic neuropathy



Dryness of the foot

# Sensory Neuropathy

- A cotton wool
- Neurotip
- Pinprick sensation
- Monofilament
- Diapason
- Neurothesiometer



# Motor Neuropathy

- **Inspection: Deformity**
- **Biomechanical evaluation:**

**Dorsi Flexion**

**Plantar Flexion**






# Autonomic Neuropathy

**Dryness of Skin  
Neuropad  
10-minute screening  
test for the early  
detection**

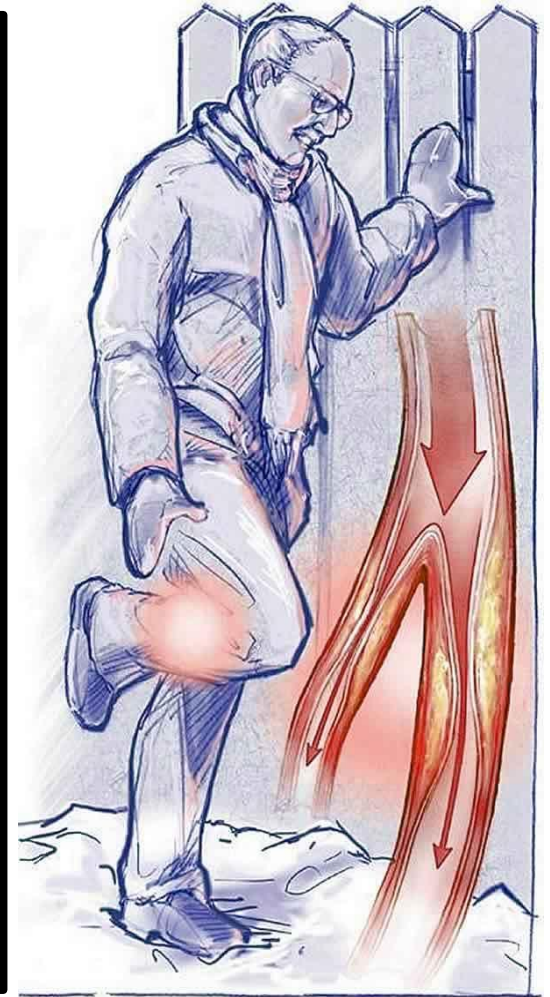




# Vascular Assessment

# Indicators of Peripheral Vascular Disease on Examination

- Cool skin
- Pale or cyanosed
- Shiny
- Loss of hair
- Onychodystrophy
- **Dependent Rubor**
- Ankle brachial index  $<0.9$
- Absent or weak Peripheral pulses
- Claudicating



# Dependent Rubor Test

- Patient position: **Supine**
- Elevate the legs degrees: **60 degrees**
- Duration: **1 minute**;

then examine sole color, PAD causes change from **pink** to **pale** or **gray** in dark-skinned people.

# Vascular examination



- **Dorsalis Pedis**

# Vascular examination ...



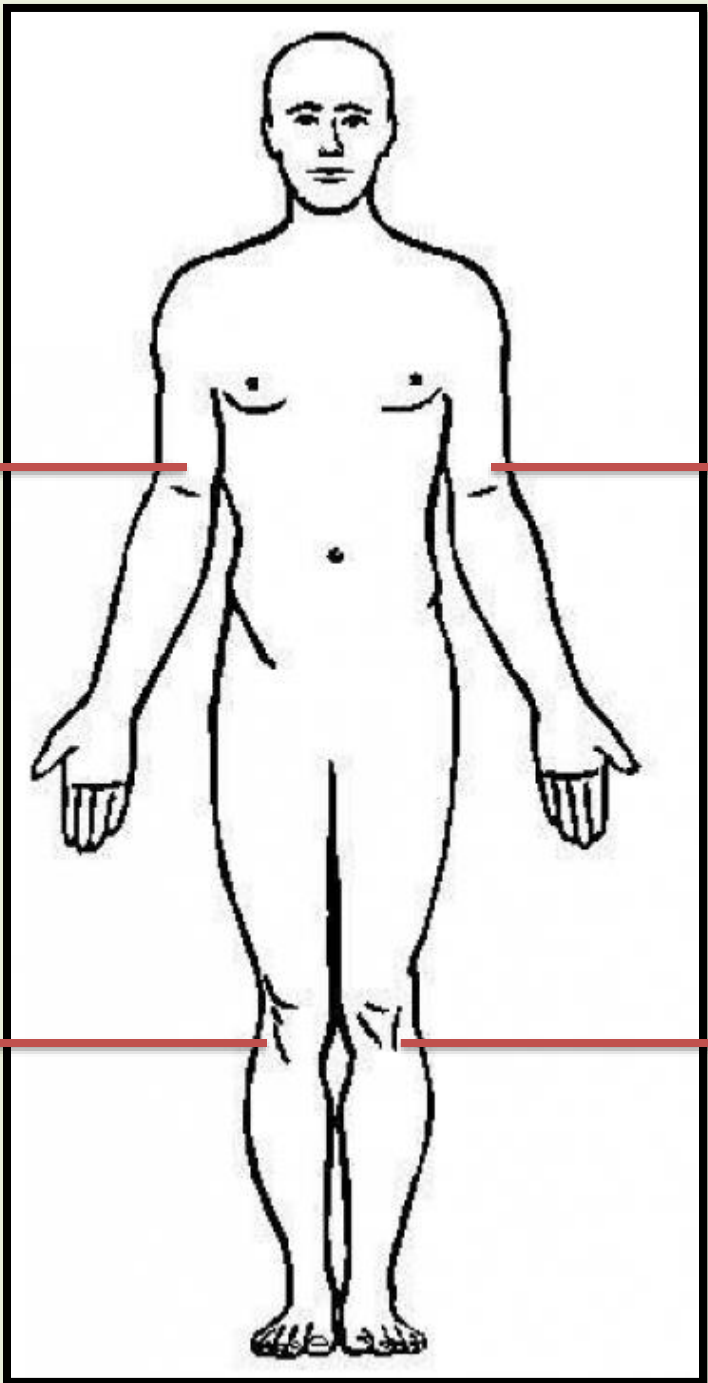
- **Posterior Tibialis**

# Ankle-Brachial Index: ABI

A test which compares the blood pressure in the ankles to the blood pressures in the arms:

Higher of either the **dorsalis pedis** or **posterior tibial** pressures /  
Higher of the **brachial** pressures





R: 130

L: 120

ABI:  $110 \div 130$

ABI:  $105 \div 130$

R: 110

L: 105

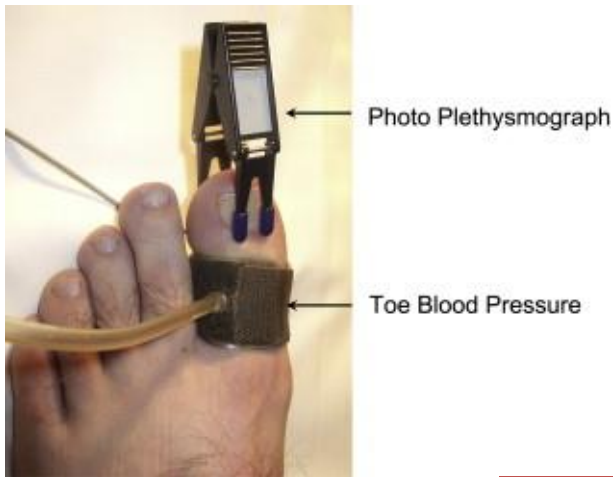


# Table 1. Ankle brachial index results and associated PAD severity.

ABI Measurement	Interpretation
$\geq 1.3$	Abnormal calcification
$\geq 1.0$	Normal Value
0.9 – 0.99	Borderline PAD
0.7 – 0.89	Mild PAD
0.5 – 0.69	Moderate PAD
$< 0.5$	Severe PAD with impending gangrene

# Toe Brachial Index: TBI

Higher of Toe pressures / Higher of the brachial pressures



**Normal**

**>0.7**

•Rosenblum BI. Maximizing foot salvage by a combined approach to foot ischemia and neuropathic ulceration .Diabetes Care 1994; 17:983.

**Table 1.** The IVGDF 2019 Risk Stratification System and corresponding foot screening frequency

Category	Ulcer risk	Characteristics	Frequency*
0	Very low	No LOPS and No PAD	Once a year
1	Low	LOPS or PAD	Once every 6-12 months
2	Moderate	LOPS + PAD, or LOPS + foot deformity or PAD + foot deformity	Once every 3-6 months
3	High	LOPS or PAD, <i>and</i> one or more of the following: - history of a foot ulcer - a lower-extremity amputation (minor or major) - end-stage renal disease	Once every 1-3 months

\* Screening frequency is based on expert opinion, since there is no published evidence to support these intervals.

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# References:

- Lavery, Lawrence A., Joseph W. Lemaster, Joseph L. Mills Sr, Michael J. Mueller, Peter Sheehan, and Dane K. Wukich. "Comprehensive foot examination and risk assessment." *Diabetes care* 31, no. 8 (2008): 1679.
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<http://emri.tums.ac.ir/dmfoot>



## گروه تحقیقاتی پای دیابتی

مرکز تحقیقات دیابت  
پژوهشگاه علوم غدد و متابولیسم  
دانشگاه علوم پزشکی تهران

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