

# Diabetic Foot & Diabetic Foot Infection

By

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# Diabetic Foot & DFI

- Number of people with Type II DM is increasing:
  - 1- Changing life style
  - 2- Aging of the population
- UAE: 2<sup>nd</sup> place 24%, KSA 3<sup>rd</sup> place 16%, **Egypt 11%**

# Diabetic Foot & DFI

- Feet of many of those patients are at risk of ulceration and amp.
- 25% of Diabetics have foot ulcer
- A foot ulcer precedes 85% of amputations
- A large proportion of such amputations could be prevented



# Diabetic Foot & DFI

Incidence of PAD in Diabetics: 38%

Only 7% are assessed for arterial  
insufficiency

# Diabetic Foot & DFI

## Anatomical Considerations

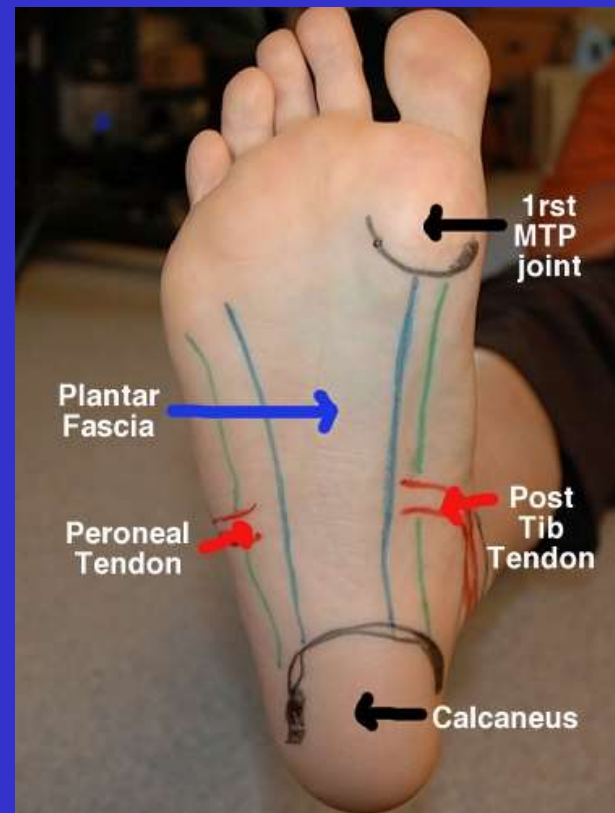
- Dorsum and sole of the foot
- Bones of the foot
- Muscles and tendons
- Arches of the foot
- Nerves of the foot
- Arteries of the foot
- Functions of the foot

# Diabetic Foot & DFI

## Anatomical Considerations

- Sole of the foot

Thick layer of the skin  
with abundant sweat  
glands

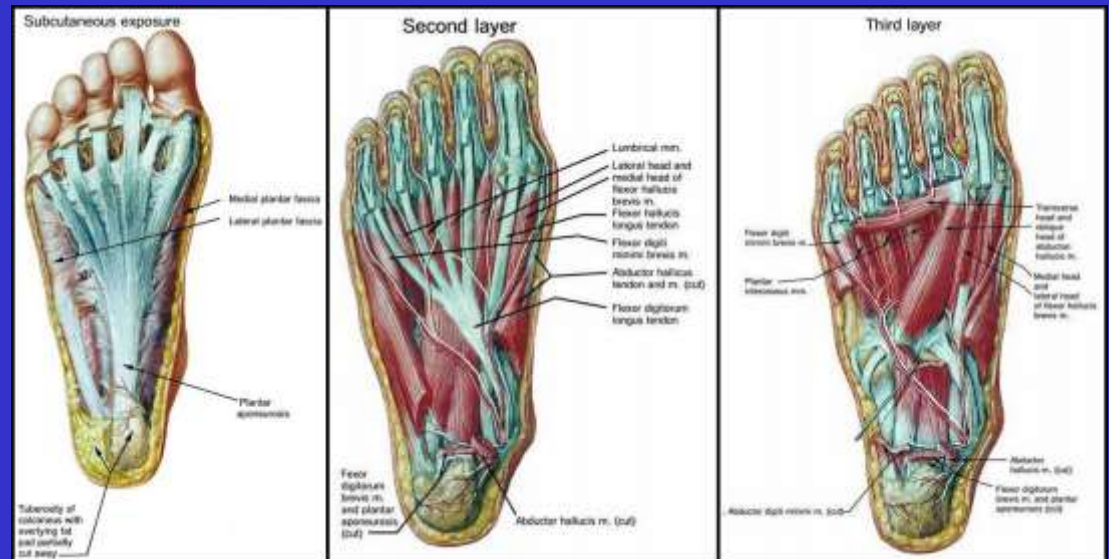


# Diabetic Foot & DFI

## Anatomical Considerations

### ■ Sole of the foot

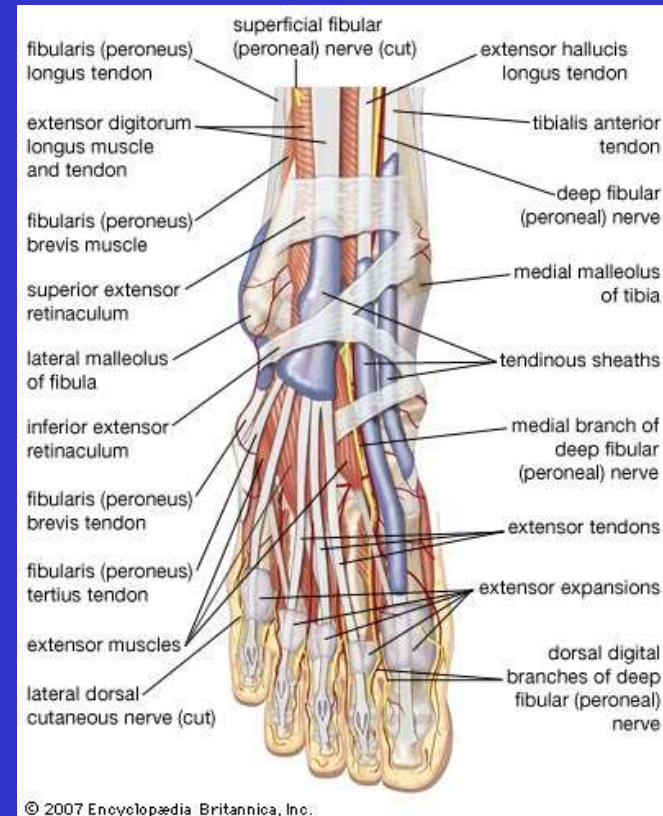
- Thick pad of fat
- Aponeurosis
- 4 muscle layers
- Bones
- Arteries, veins
- Tendons, nerves



# Diabetic Foot & DFI

## Anatomical Considerations

- Dorsum of the foot

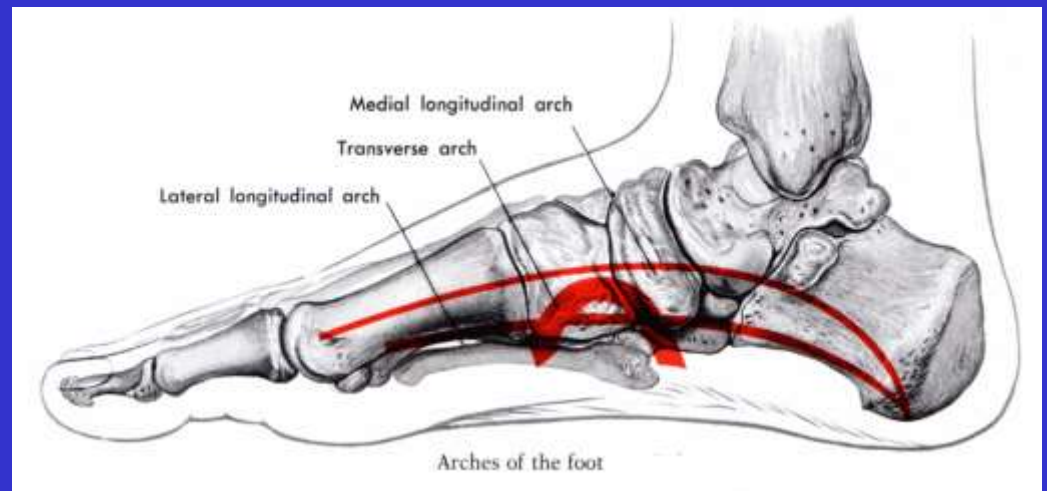




# Diabetic Foot & DFI

## Anatomical Considerations

- Bones and arches of the foot



# Diabetic Foot & DFI

## Anatomical Considerations

- **Bones and arches of the foot**
  - Medial Longitudinal arch
  - Lateral Longitudinal arch
  - Transverse arch
  
- Shape of the bones
- Plantar aponeurosis
- Ligaments
- Long tendons and small muscles of the foot

# Diabetic Foot & DFI

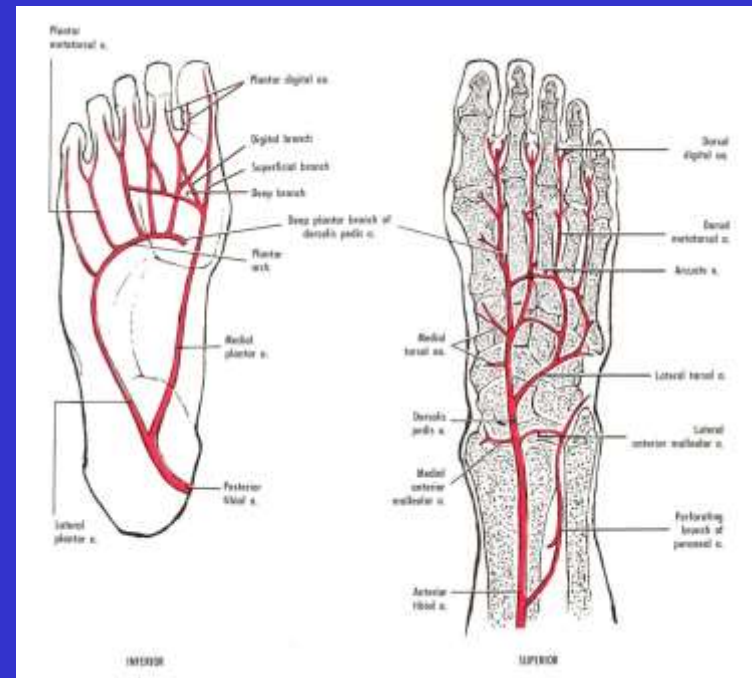
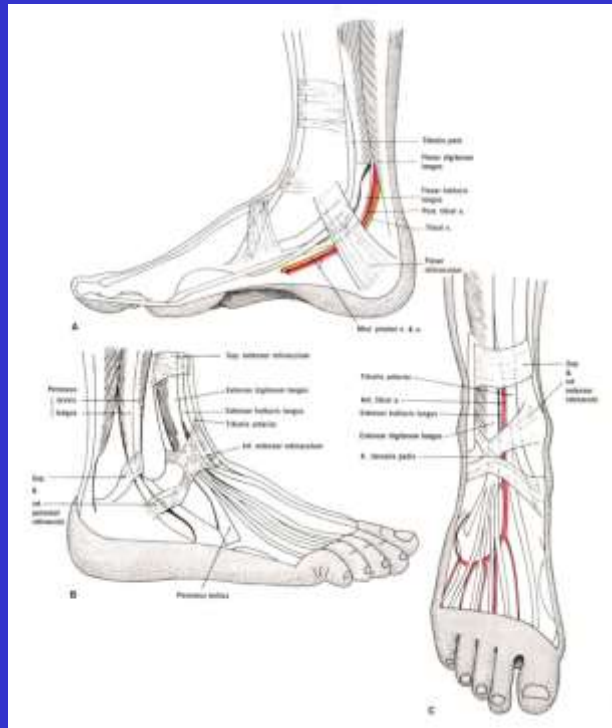
## Anatomical Considerations

- Nerves of the foot
  - ❖ Sensory
  - ❖ Motor
  - ❖ Autonomic

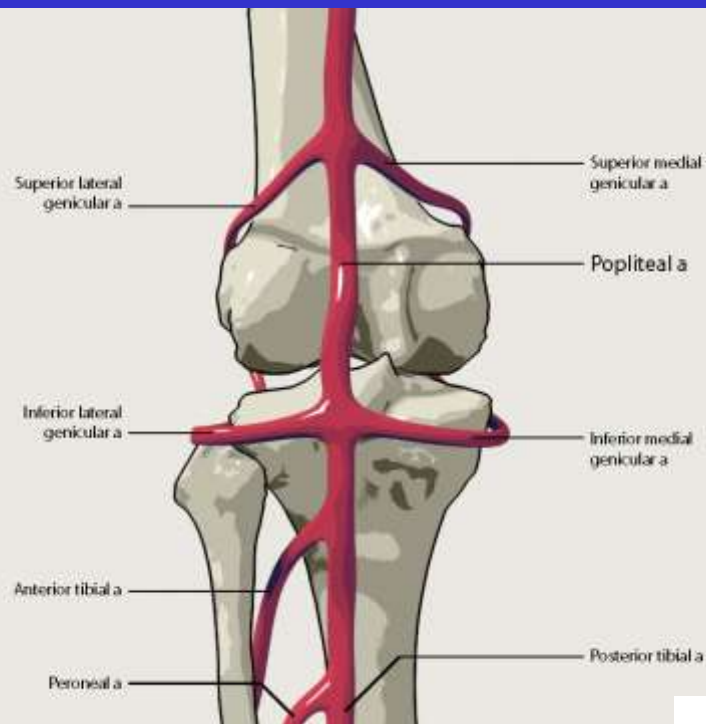
# Diabetic Foot & DFI

## Anatomical Considerations

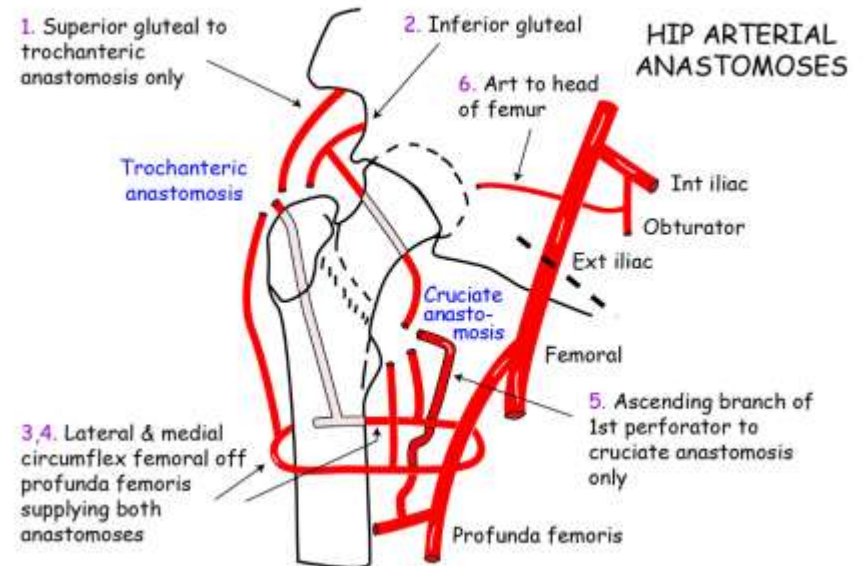
- Arterial supply of the foot



# Anastomosis around the Knee



# Anastomosis around the Hip



# Diabetic Foot & DFI

## Anatomical Considerations

- Functions of the foot

5 miles /day

1000 ton pressure /day

- ❖ Weight Bearing

- ❖ Movement

# Diabetic Foot & DFI

**Diabetic foot:** Compilation of signs and symptoms and complications occur in the feet of patients with poor glycemic control

# Diabetic Foot & DFI

Hba1c > 7%

Each 1% ↑ → 15% ↑ in PAD

Each 1% ↑ → 50% ↑ in PN



# Diabetic Foot: Role of Vascular Surgeon



# Diabetic Foot: Role of Vascular Surgeon



# Diabetic Foot: Role of Vascular Surgeon



# Diabetic Foot: Role of Vascular Surgeon



**DF** →

**Serious**



**Diabetic Foot Infection is An Emergency**

**DF** →

**Serious**

- Factors impede early detection
- Patient's low defense leading to bacterial infection
- Arterial insufficiency
- Peripheral neuropathy
- Co-morbidities: Cardiac, Renal....etc.

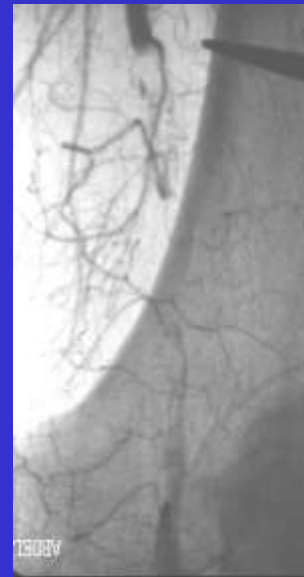
# Pathophysiology of DF

## Arterial Insufficiency in DM

### Macro-angiopathy

- Aorto-iliac
- Femoro-popliteal
- *Infragenicular "Tibial"*

### Micro-angiopathy





# Pathophysiology of DF

## Arterial Insufficiency in DM

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# Pathophysiology of DF

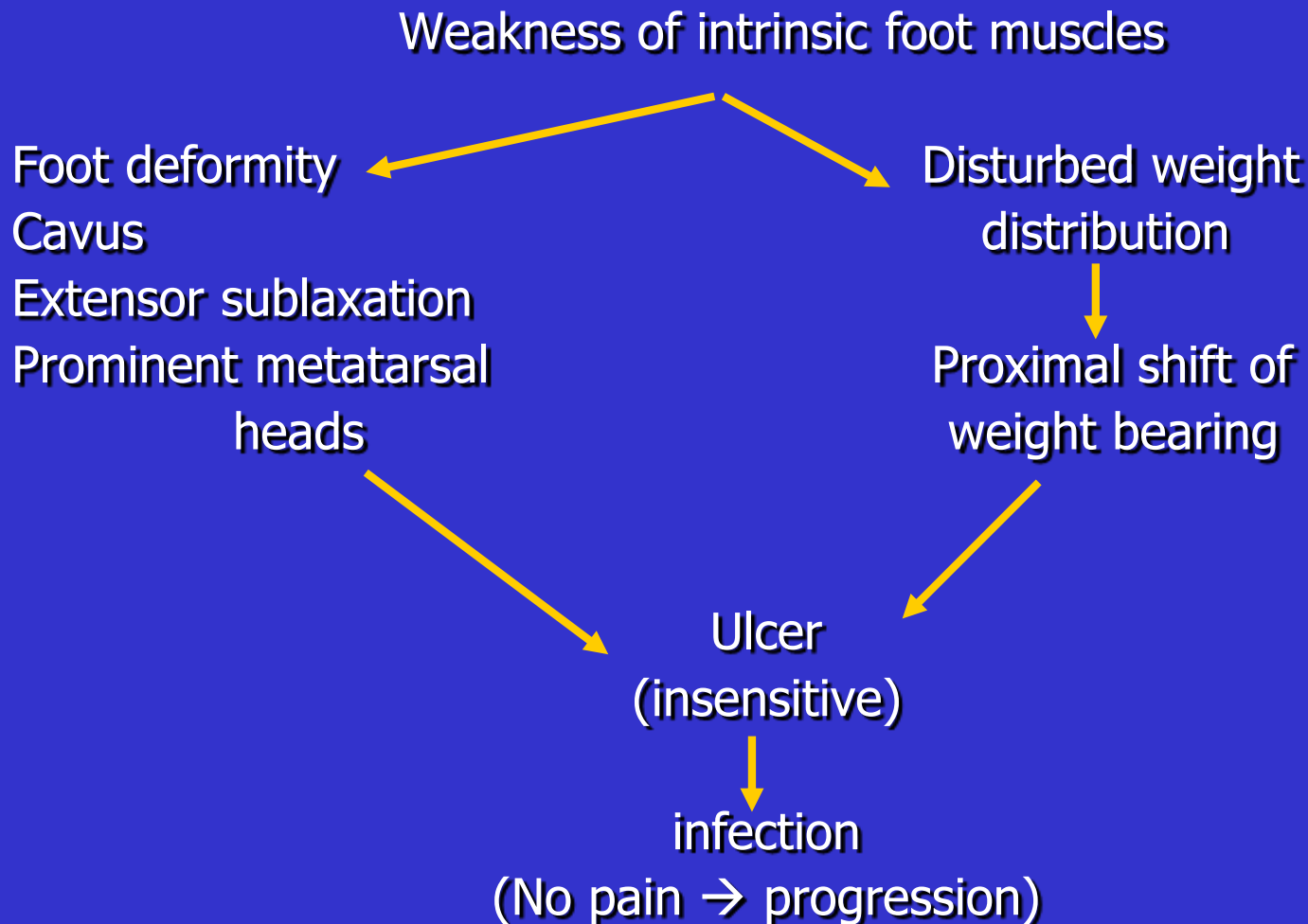
## Peripheral Neuropathy

### Sensory

- ▶ Parasthesia: Tingling, Numbness,.....
- ▶ Loss of vibration
- ▶ Loss of light touch
- ▶ Loss of pain
- ▶ Loss of deep tendon reflexes

# Peripheral Neuropathy

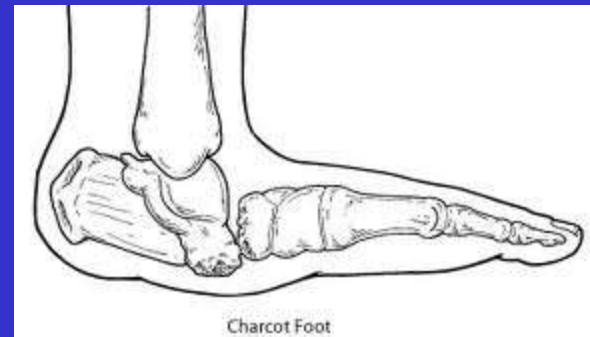
## Motor



# Diabetic Foot Deformity



Charcot's Joint



# Mal Perforans



# Peripheral Neuropathy

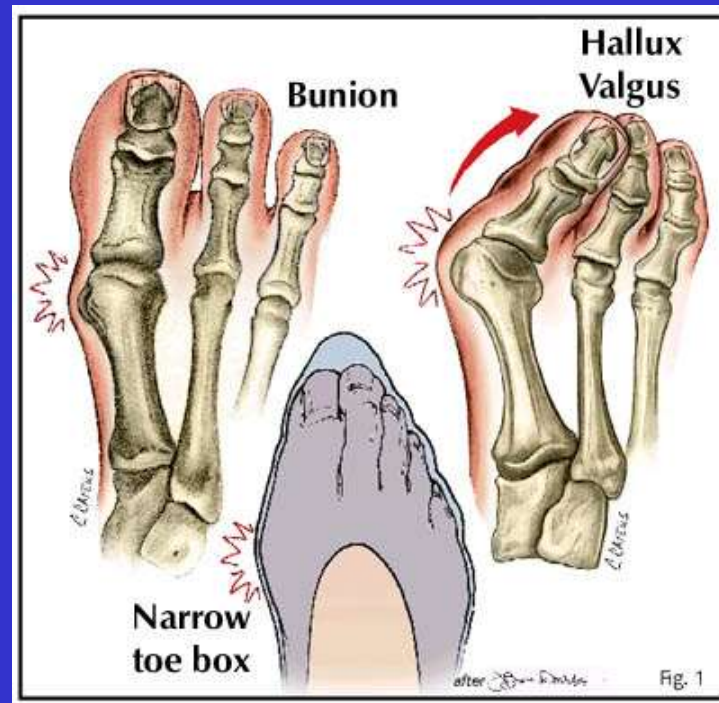
## Autonomic

### Auto-sympathectomy

- Dry skin → fissures → infection
- Impaired vascular response to infection
- Opened AVF → Bone degeneration (Charcot's joint)



# Diabetic Foot Deformity





# Diabetic Foot: Role of Vascular Surgeon

## Types of Diabetic Foot Lesions

- 1- Neuropathic ulcer
- 2- Ischemic ulcer
- 3- Infective ulcer



# Evaluation of Arterial Insufficiency in DF

- Clinical Examination "Pulsations"
- Ankle/Brachial Index "ABI"
- Toe/Brachial Index
- CDU "duplex"
- CTA



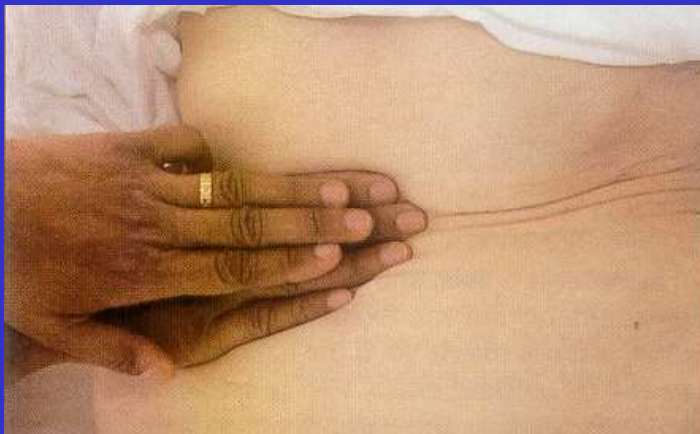
# Arterial insufficiency

## Clinical Presentation

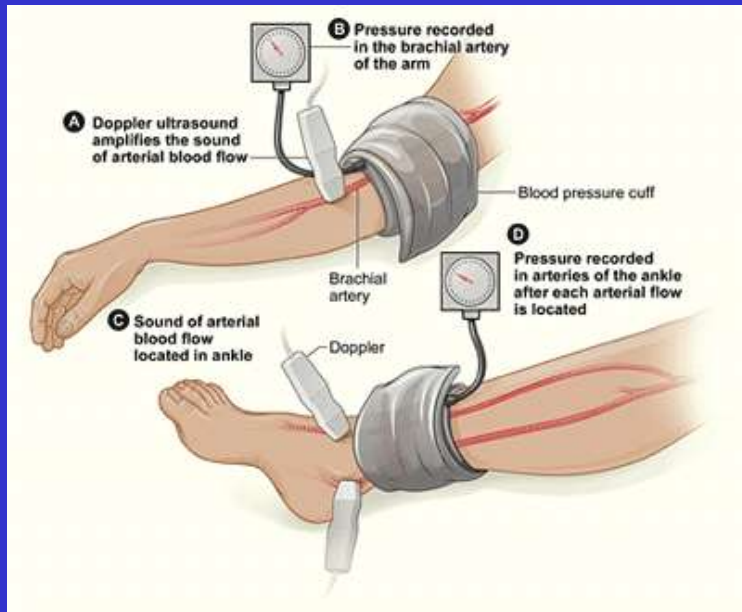
%	Clinical presentations
43%	Rest pain
33%	Toe gangrene
24%	Unhealed foot amputation stump & ischaemic ulcers

# Evaluation of Arterial Insufficiency in DF

## ■ Clinical Examination "Pulsations"



# Evaluation of Arterial Insufficiency in DF



ABI

# Evaluation of Diabetic Foot



Plain X-ray



# Osteomyelitis



# Foreign Bodies





Air under the skin





Deformities



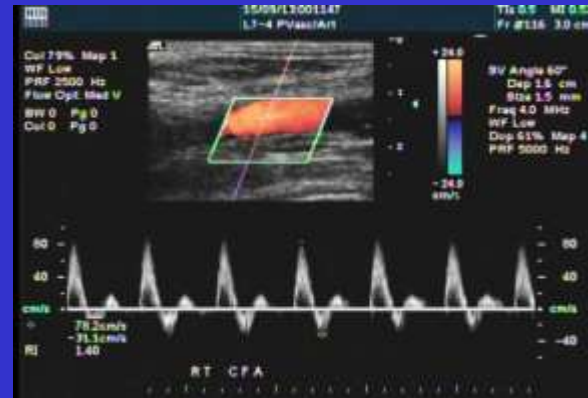


Pathological Fracture

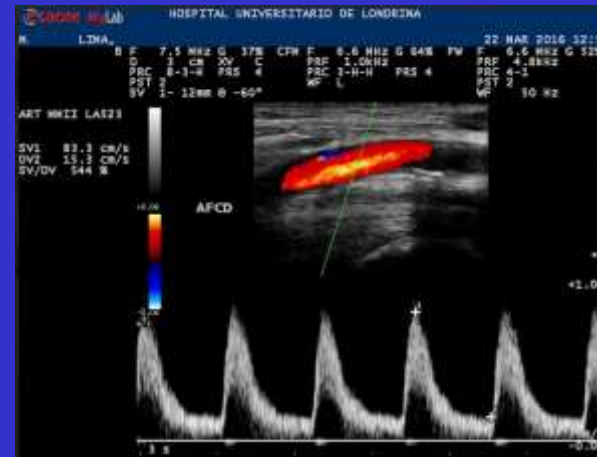


Arterial wall calcification

# Arterial Duplex



**Triphasic**



**Biphasic**



**Monophasic**

# CTA



# Evaluation of Neuropathy in DF



# Diabetic Foot: Management

- Preventive “prophylactic” measures
- Detection and treatment of early lesions
- Proper interventions for DF lesions

# Diabetic Foot: Management

- Control of Blood Glucose Level

Hba1c < 6%



# Diabetic Foot: Management

- **Avoid Risk factors**





# Diabetic Foot: Management

## ■ Foot care



# Diabetic Foot: Management

## ■ Daily Foot care

1- Washing your feet

2- Drying between the toes



# Diabetic Foot: Management

## ■ Daily foot care

### 3- inspect your feet



# Diabetic Foot: Management

## ■ Daily foot care

### 3- inspect your feet

- Redness
- Induration
- Hotness
- Blisters
- Cracks or fissures

# Diabetic Foot: Management

- Regular Foot care



# Diabetic Foot: Management

## ■ Foot Wear



# Diabetic Foot: Management

## ■ Prevent Foot Injury

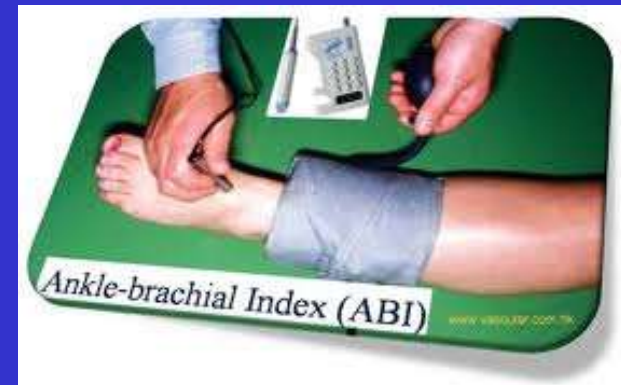
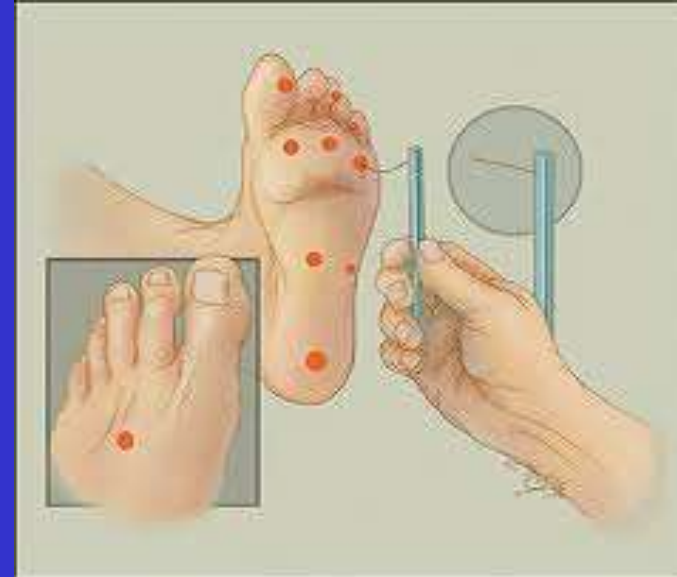
- Bare feet
- Hot water
- Sun bathes
- Ill-fitted shoes
- Hard objects





# Diabetic Foot: Management

- Regular check ups





# Diabetic Foot: Management

- Treat early lesions



# Diabetic Foot: Management

- Special centers “Podiatrist”



# Diabetic Foot: Management

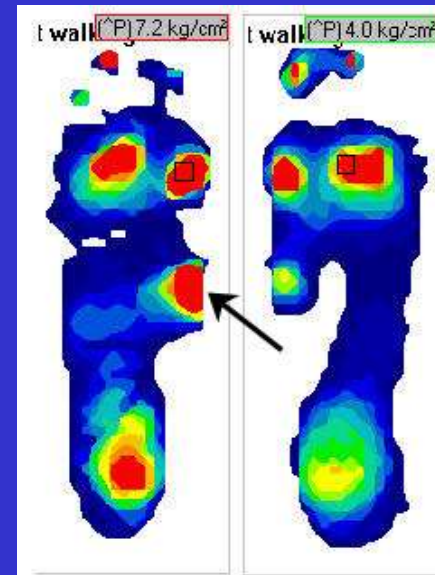
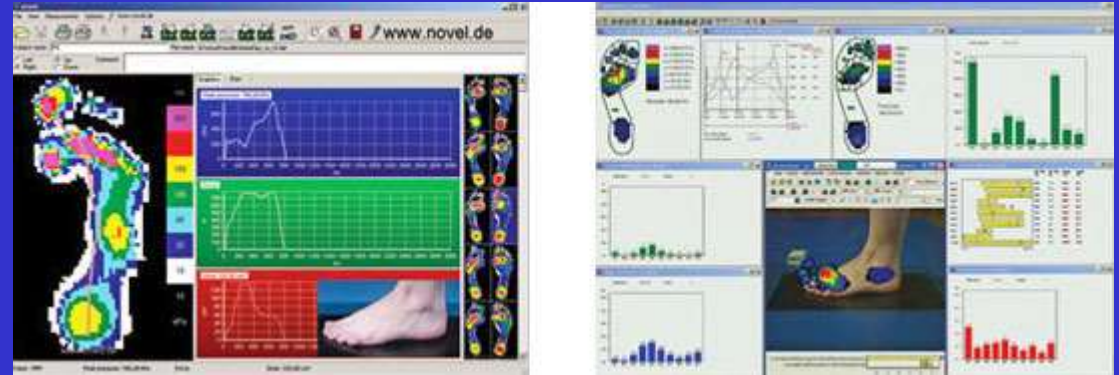
## ■ Smart phones for DF



# Diabetic Foot: Management

## Neuropathic ulcers

### Foot print



# Diabetic Foot: Management

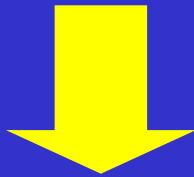
## Neuropathic ulcers

### Off-loading

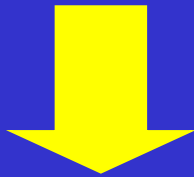




# “Mal-perforans”



Dorsal excision of MPJ

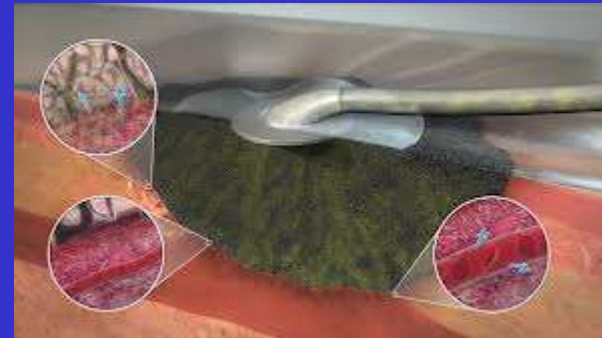


1. Remove septic focus.
2. Eliminate pressure point.



# Diabetic Foot: Management

## Wound Management



VAC Therapy



# Diabetic Foot: Management

- Ischemic ulcers and arterial insufficiency

## Medical treatment

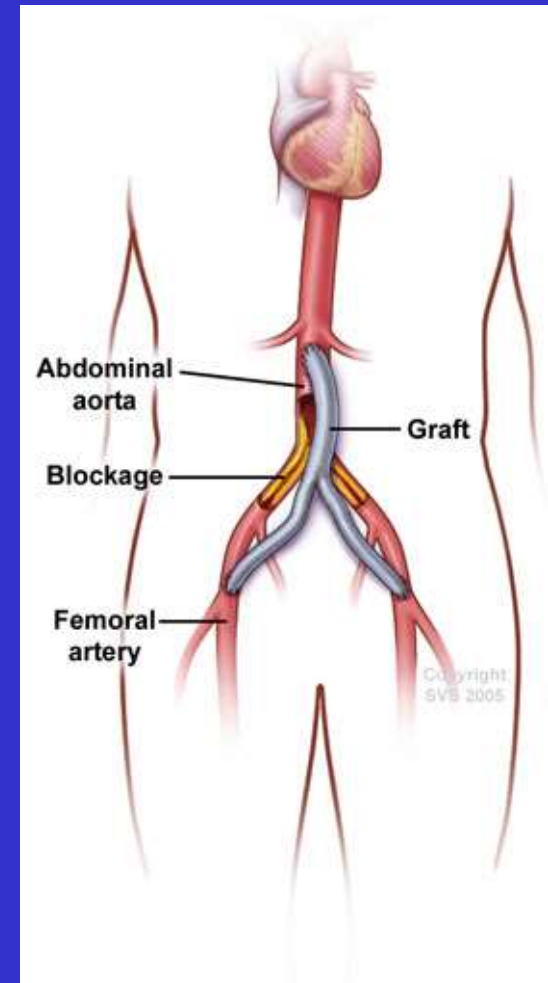
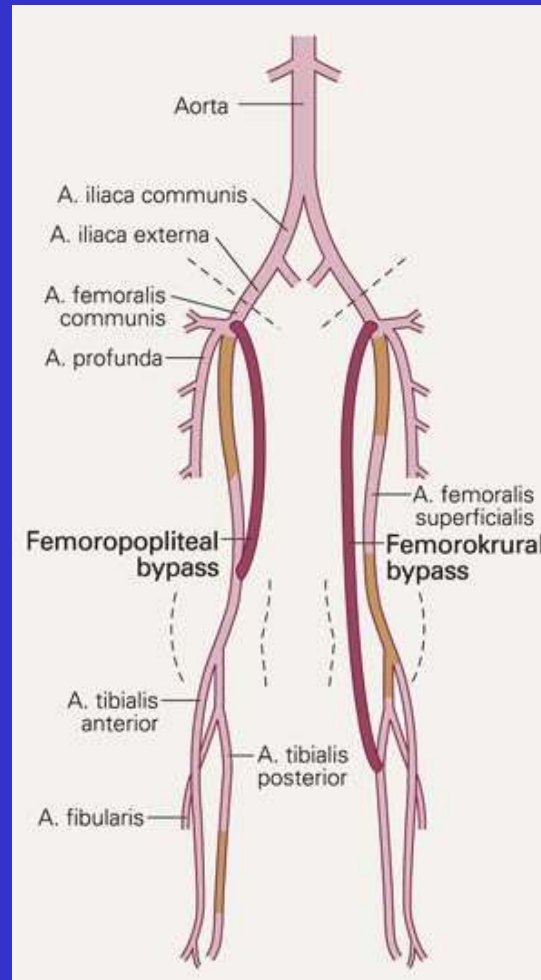
- 1- Cilostazol, Naftidufuryl, Pentoxiphylline
- 2- Antiplatelets
- 3- LMWH
- 4- Statins



# Diabetic Foot: Management

- Ischemic ulcers and arterial insufficiency

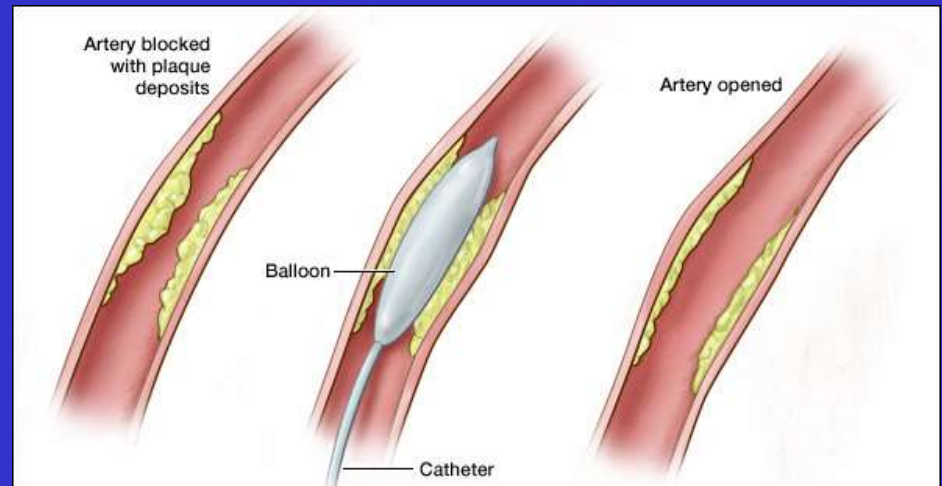
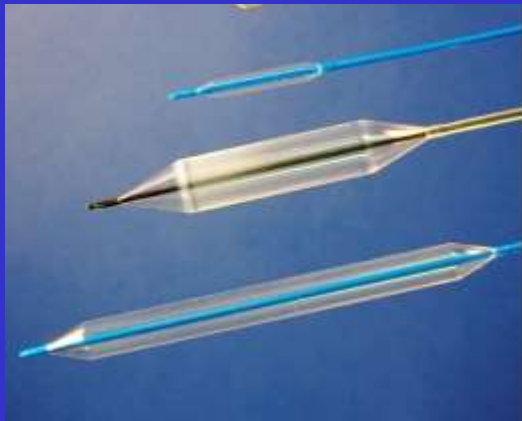
## Bypass Surgery



# Diabetic Foot: Management

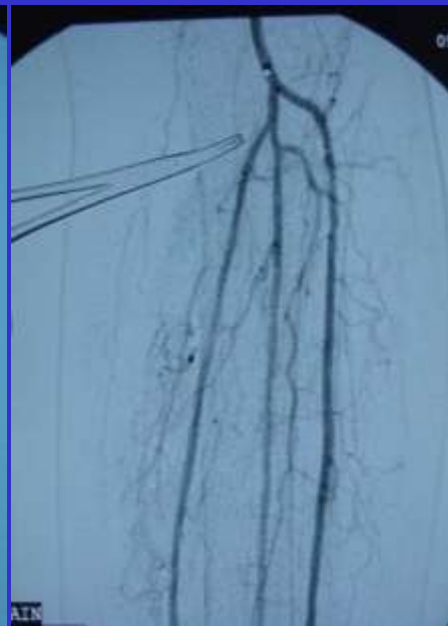
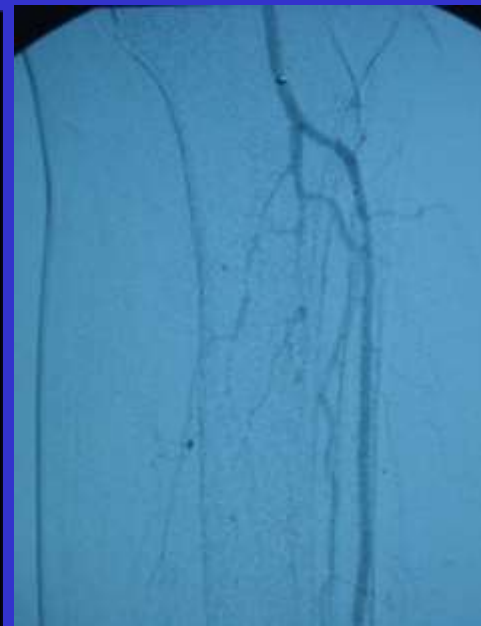
- Ischemic ulcers and arterial insufficiency

## Endovascular Interventions



# Diabetic Foot: Management

## Endovascular Interventions



# Diabetic Foot: Management

## ■ Infective lesions and ulcers

Types:

- 1- Superficial skin infections
- 2- Deep infection or ulcer involving tendons, ligaments or bones
- 3- Deep infection or ulcer with osteomyelitis or septic arthritis
- 4- Infective gangrene of the forefoot or heel
- 5- infective gangrene of the whole foot

# Diabetic Foot: Management

## ■ Infective lesions and ulcers

Severity:

1- Non-threatening

2- Threatening with moderate infection

3- Threatening with severe infection and toxemia

# Diabetic Foot: Management

- Infective lesions and ulcers

Special types:

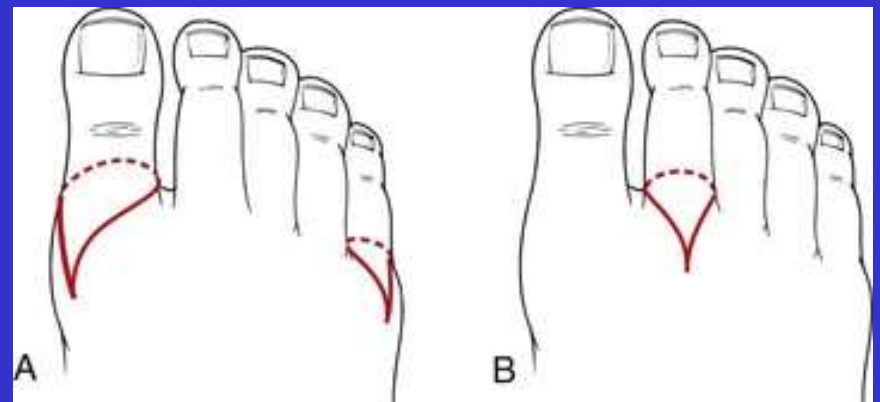
1- Deeply-seated foot abscess

2- Necrotizing Fasciitis

# Diabetic Foot: Management

## ■ Infective lesions and ulcers

- 1- Broad spectrum antibiotic
- 2- Extensive debridement for any necrotic tissues
- 3- I & D of any collection
- 4- Amputations



# DF

Cellulitis only

IV antibiotics

Resolve

Persist

➤ Abscess

➤ Gangrene

➤ Ulcer

+ Open joint "mal perforans"

Foot care

Imaging

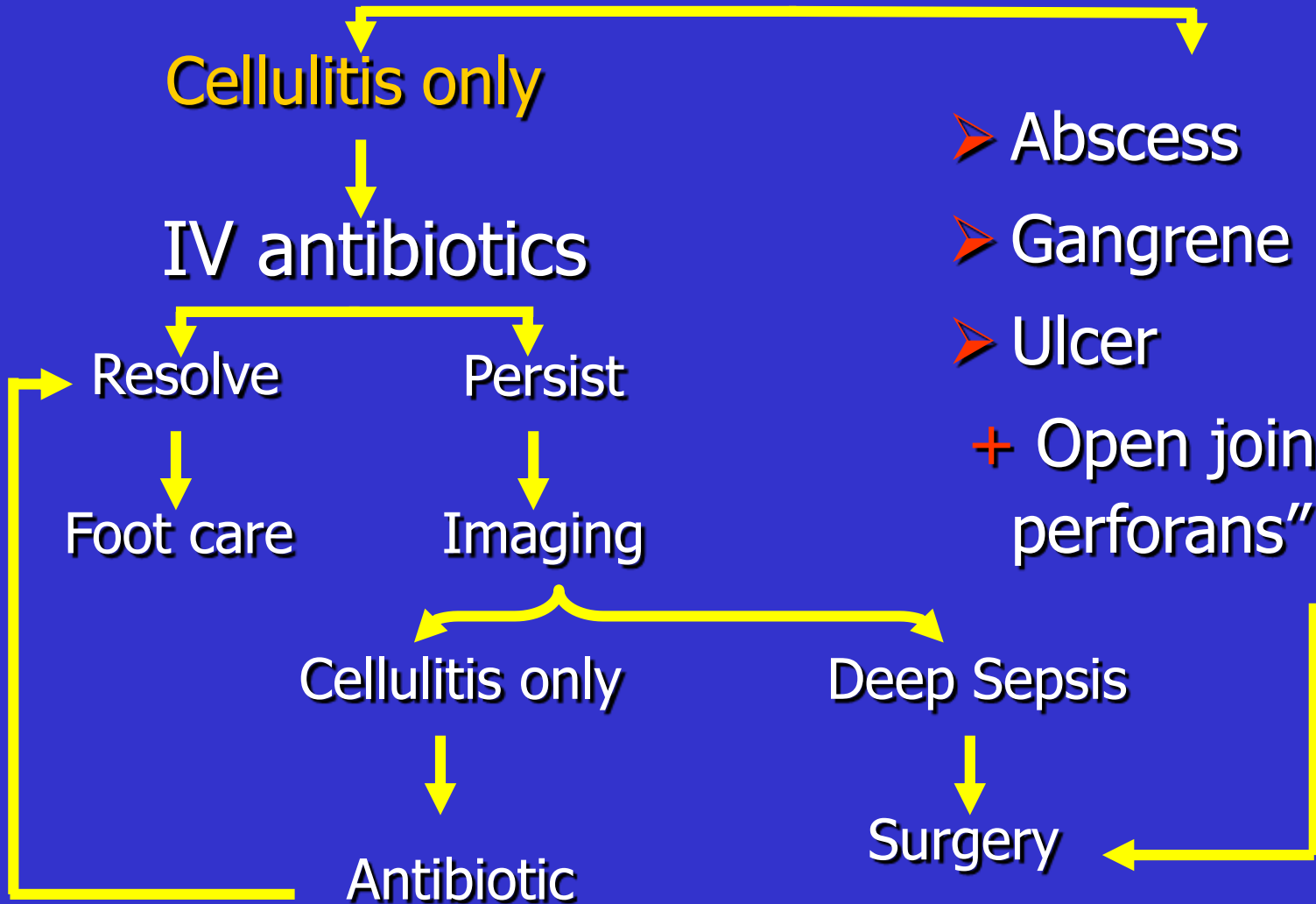
Cellulitis only

Deep Sepsis

Antibiotic

Surgery

(Dose, Duration, Drug)





# Diabetic Foot: Charcot's Joint

Named after a French physician 2ry to syphilis,  
DM

**Definition:** Subluxation, dislocation, osteoporosis of the small bones and joints of the foot due to laxity of the ligaments and hyperemia of the bones of the foot

**Incidence:** 10% of Diabetic PN  
16% of patients with neuropathic ulcer

# Diabetic Foot: Charcot's Joint

## Aetiology and pathophysiology

PN leading to sympathetic neuropathy and hyperemia leading to decalcification of the bones and then fractures or subluxation of the joints.

Sensory PN leading to neuropathic ulcer and weight bearing

# Diabetic Foot: Charcot's Joint

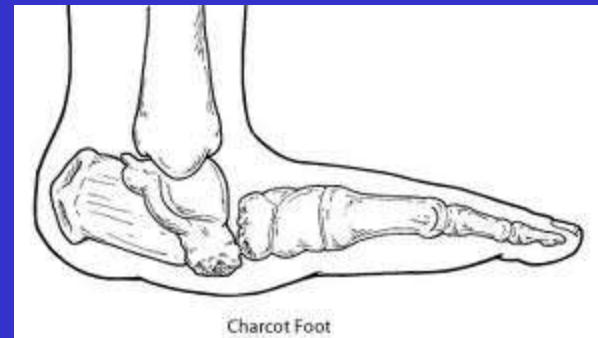
## Stages

- Acute Stage: Swelling and hottness
- Subacute: Loss of foot arch "flat foot"
- Chronic Stage: Fractures and dislocation

# Diabetic Foot Deformity



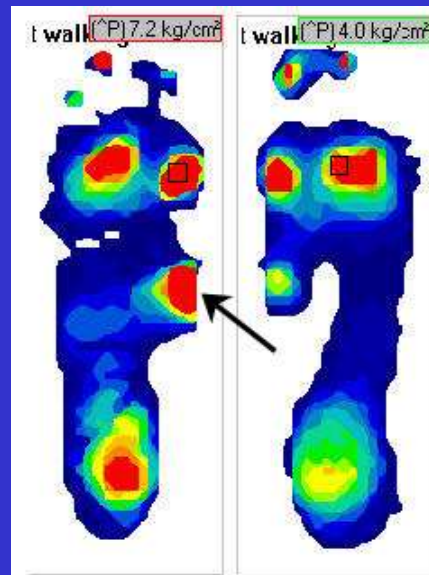
Charcot's Joint



# Diabetic Foot: Charcot's Joint

## Investigations

- Plain x-ray
- FNAB
- Foot Print
- MRI




# Diabetic Foot: Charcot's Joint

## Treatment

- Acute Stage: Bed rest  
Total Contact Cast  
Off loading  
Bisphosphnate
- Chronic Stage: off loading "Air walker"





Good  
Luck!