

# **Diabetic Neuropathic Arthropathy (Charcot)**

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# Charcot

- 1. What is it? (definition) & Who gets it?  
(epidemiology & predisposing factors)**
- 2. How do I recognize it? (diagnosis)**
- 3. Natural history & Classification**
- 4. How do I treat it? (treatment)**

# Neuropathic arthropathy

## Definition

**Noninfective, destructive,  
bone and joint fractures and dislocations  
associated with a peripheral neuropathy**

# History

**Charcot (1868) : manifestation of tertiary syphilis**

**Jordan (1936) : neuropathic arthropathy of diabetes mellitus**

**Diabetes leading cause of Charcot arthropathy**

# Demograpics

**Occurs in 0.8 – 7.5% of diabetics**

**Average age : 57 y.o.**

**Average duration of diabetes : 15 years**

**Bilaterality : 6 – 40%**

**Equal sex distribution**

# Pathophysiology

- **Theory I : repetitive microtrauma**  
unrecognized by the sensory neuropathy
- **Theory II: auto-sympathectomy**  
loss of vascular regulation caused by  
autonomic neuropathy
- **General lack of ischemia in Charcot feet**
- **Clinically hypervascular in early stage**



# Pathophysiology

## **Sensory neuropathy**

Loss of protective sensation

Loss of proprioception

Autonomic : change of blood flow

**Unrecognized injury (acute or overuse)**

**Continued repetitive stress (on injured structure)**

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# Evaluation

**The diagnosis is primarily clinical**

**Early diagnosis and treatment is important**

**History**

**Exam**

**X-ray**

# History

**DM neuropathy**

**DM duration**

**Injury history**

**Charcot until proven otherwise**

# Physical Exam

**Painless swelling**

**No skin ulcer**

# Clinical Presentations

- **Swelling: most common, always present**
- **Inflammation: localized heat, erythema**
- **Redness will subside with elevation (10min.)**
- **Pain: cc in 50% of cases, not commensurate with amount of osseous destruction**
- **Often precede radiographic changes by 2- 6 weeks**

# Clinical Problems

- **Deformity:**  
shoewear difficult  
bony prominences :ulceration and infection
- **Instability:**  
loss of structural support of limb
- **Infection:**  
ulceration caused by deformity
- **Loss of plantigrade position: esp. hindfoot**

# Infection vs Charcot

warm, red, swelling, WBC, sed rate, bone scan

**Infection** : wound, ulcer, poor glucose control,  
lymphangitis, hot indium scan

X-ray : osteolysis, periosteal rx, gas in soft tissue

**Charcot** : no ulcer, no glucose change, no  
lymphangitis, cold indium scan

X-ray : fragmentation, heterotopic bone, sclerosis

# Indium and Technetium Scan

Indium WBC scan first

Day one : WBC labeled & inject

Day two : scan

if uptake : technetium scan

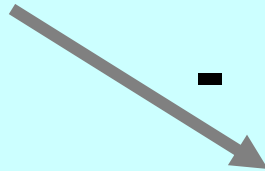
**indium (infection, inflm, not bony repair)**

**+**



**technetium**

**-**



**not bony or soft t inf**

same lesion : **osteomyelitis**

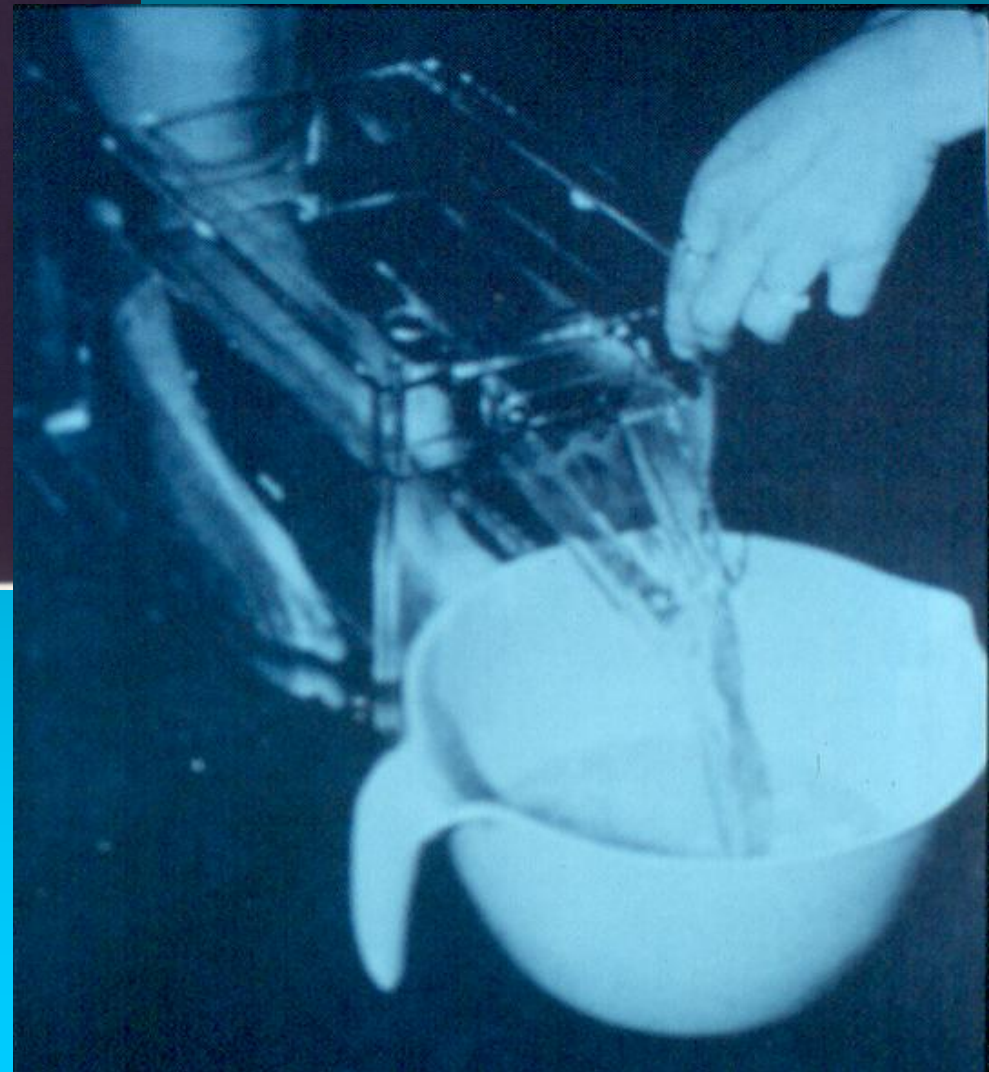
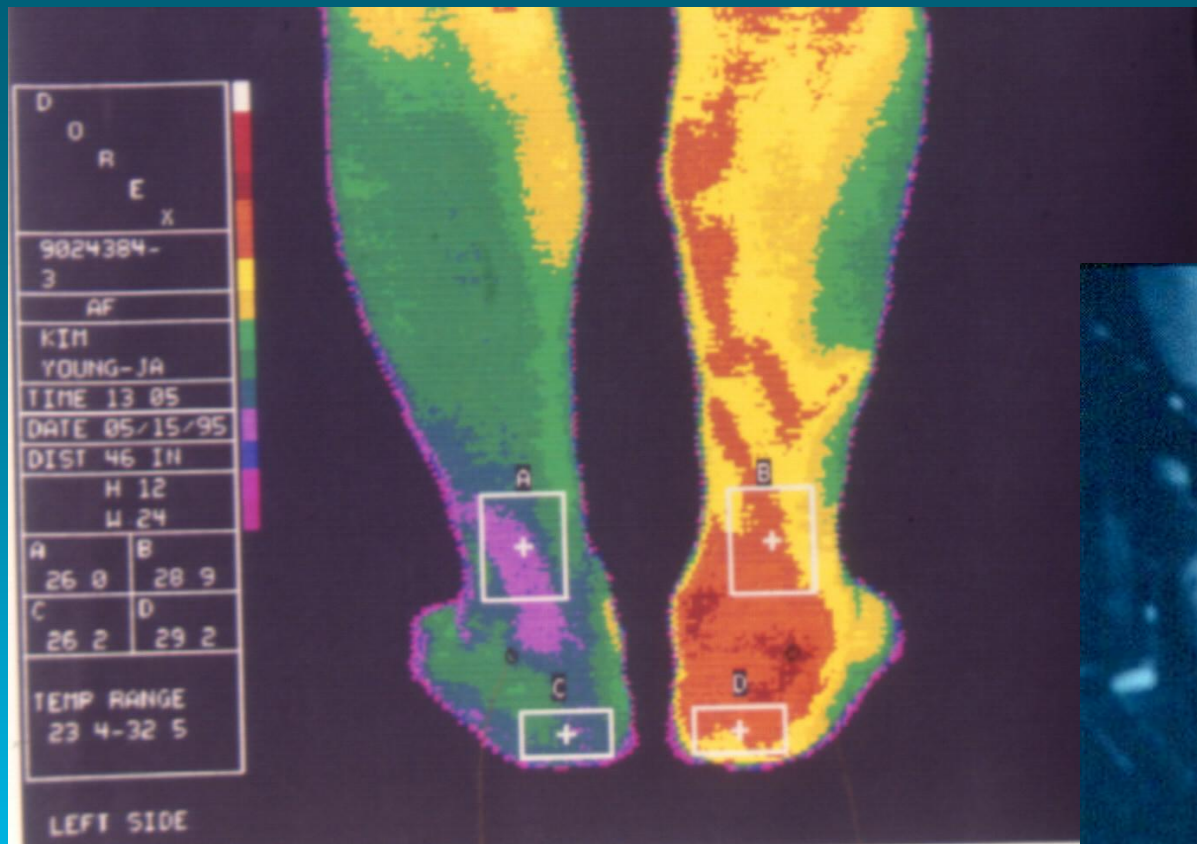
**neuropathic Fx**

other lesion : **cellulitis, abscess**



# Key Points for Differentiation

- **Intact skin with red, warm, swollen : Charcot**
- **Average glucose control**
- **Stage I or II : deep bone infection in Charcot is very rare**
- **MRI is not helpful unless an abscess is found**



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# **Natural Hx (Eichenholtz Stages)**

**Characteristic change from acute phase to healing phase**

**Stage I : Dissolution**

**Stage II : Coalescence**

**Stage III : Resolution**

# Stage I : Dissolution

- **Clinical**

**Acute inflammation :  
swelling erythema warmth**

**Pain**

**instability**

- **X-ray**

**Periarticular fragmentation**

**Joint subluxation of  
dislocation**



# Stage II : Coalescence

- **Clinical**

**less inflammation**

**increased stability of  
fragments**

- **X-ray**

**periosteal new bone**

**early healing of fracture  
frgements**



# Stage III : Consolidation

- **Clinical**

**fixed deformity**

**little swelling**

**no redness or warmth**

- **X-ray**

**consolidation of fragment :**

**bony fibrous ankylosis**

**smoothing of borders of  
large fragments**

**sclerosis**







# Anatomic(Radiographic) Classification

- Brodsky anatomic classification

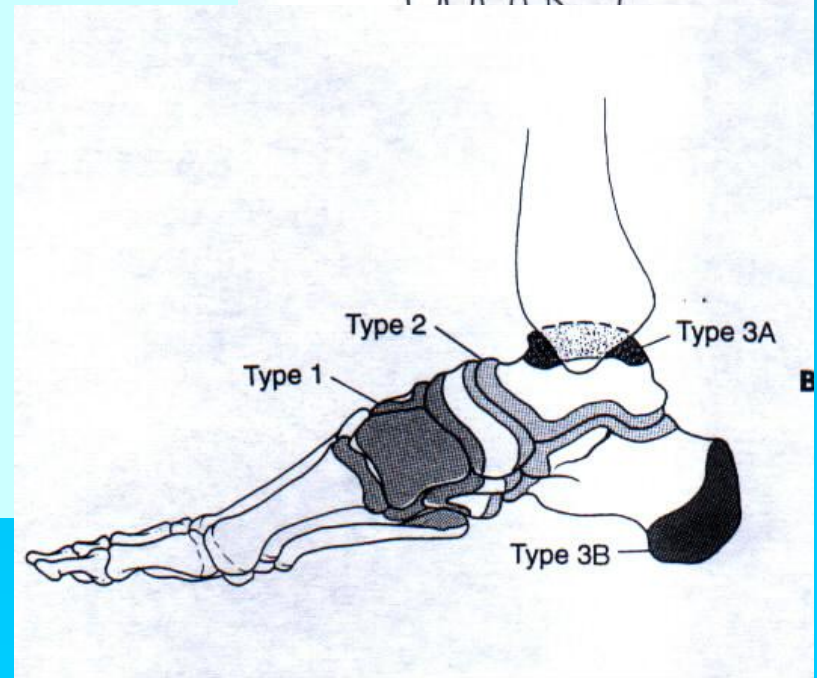
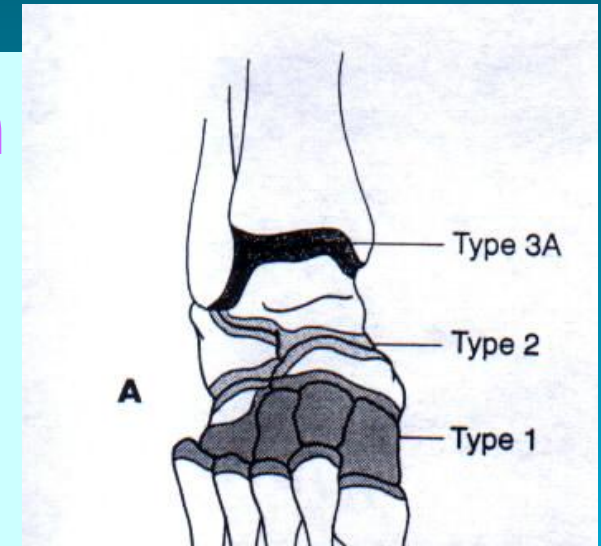
**Type I                      midfoot**

**Type II                     hindfoot**

**Type IIIA                  ankle**

**Type IIIB                  calcaneus**

**\*Forefoot charcot**



# Forefoot

- **Clinical**  
**forefoot ulcers**  
**infection**
- **Location**  
**MTP**  
**metatarsals**



5-30

L



W  
L

1-30

W  
L

1-30

# Midfoot (type I)

- **Clinical**

**most common(70%)**

**collapse : rocker bottom  
foot deformity**

**plantar ulceration**

- **Location**

**TMT**

**Nav-Cun**







# Hindfoot (type II)

- **Clinical**

**less common(20%)**  
**instability**

- **Location**

**calcaneus**  
**subtalar**  
**T-N, C-C**







# Ankle (type IIIA)

- **Clinical**  
uncommon(5-7%)  
severe instability  
varus valgus  
requires op
- **Location**  
tibiotalar









# Calcaneus (type IIIB)

- **Clinical**

least common(5%)

stable pattern

pes planus

- **Location**

os calcis :

pathologic Fx







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# Basic Concepts (I)

**Early stop progressive deformity**

**Maintain until resolution stage**

**Stable, plantigrade, braceable foot**



# Basic Concepts (II)

**Complex Fx & D/L : prolonged rest,  
immobilization and non weightbearing**

**Subuxation or dislocation : difficult to control**

**Ankle>hindfoot>midfoot>forefoot :  
complication and immobilization priods**

**Goal : plantigrade, braceable foot**

# **Treatment of Acute Charcot(stage I)**

**Immobilization and non weight bearing**

**Total contact cast**

**1 week / 3 weeks / 6 weeks / 9 weeks / 12 weeks**

**P/E : swelling, heating, instability**

**X-ray : sclerotic**

# **Treatment of Subacute (stage II)**

**Longterm casting : 4-6 months**

**Smaller fluctuation in swelling and increased  
stability : Brace**

**Patellar tendon bearing**

**AFO**

# **Treatment of Consolidation(stage III)**

## **Forefoot and midfoot deformity**

- **In-depth shoe**
- **Custom molded shoe**

## **Hindfoot and ankle**

- **Long term bracing**

# Timing of Cast Off

**Normal skin temperature**

**No erythema, swelling**

**X-ray : sclerosis, no progression**

**P/E : no instability**

# Surgical Tx of Charcot

## Indications

**Severe instability and deformity**

**nonbraceable and impending ulcer**

**Acute(<4 weeks) dislocation**

## Goal of surgery

**A plantigrade, braceable foot not normal foot**

# Surgical Tx of Charcot

## Timing of Surgery

**Usually stage III : after casting, footwear and bracing have failed**

**Early stage I : acute dislocation,  
uncontrollable deformity : inflammation is  
not significant and bone stock is sufficient**

# Contraindications of Surgery

## **Absolute**

- **Severe PVD**
- **Compliance**

## **Relative**

- **Osteomyelitis**
- **Poor bone quality**



# Type of Surgery

## **Reconstruction surgery**

- **Ostectomy (bumpectomy)**
- **Realignment and arthrodesis**

## **Acute fracture dislocation**

# **Type of Surgery (Ostectomy)**

**Prominent bone at plantar apex of rocker  
bottom foot deformity**

**Incision through intact skin**

**Full thickness flap to bone**

**Suction drain and total contact cast**

**Avoid excessive resection : further collapse**







# **Type of Surgery (Arthrodesis)**

**Alignment and stability : bracing and footwear**

**Rigid internal fixation**

**External fixation : pin site problems**

**Longterm immobilization**

**3 mo : non WB total contact cast**

**1-2 mo : WB total contact cast**















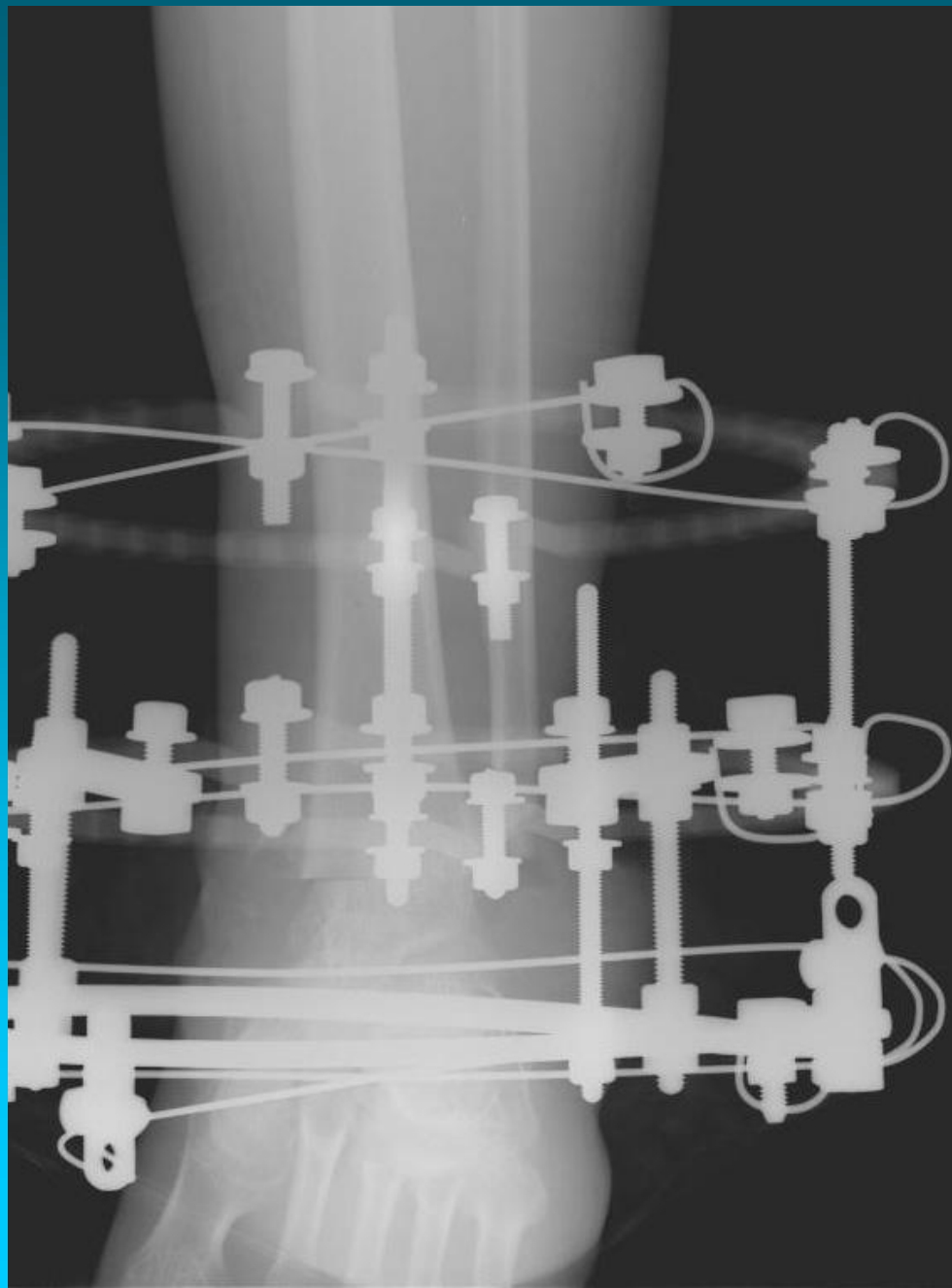












# **Acute Fx in Patient with Neuropathy**

**Most important point**

**Recognize the potential for complication**

**Warn the patient about this risk**

**Test patient insensitivity**

**Extend length of immobilization : 2 times more**

**Serial check up**











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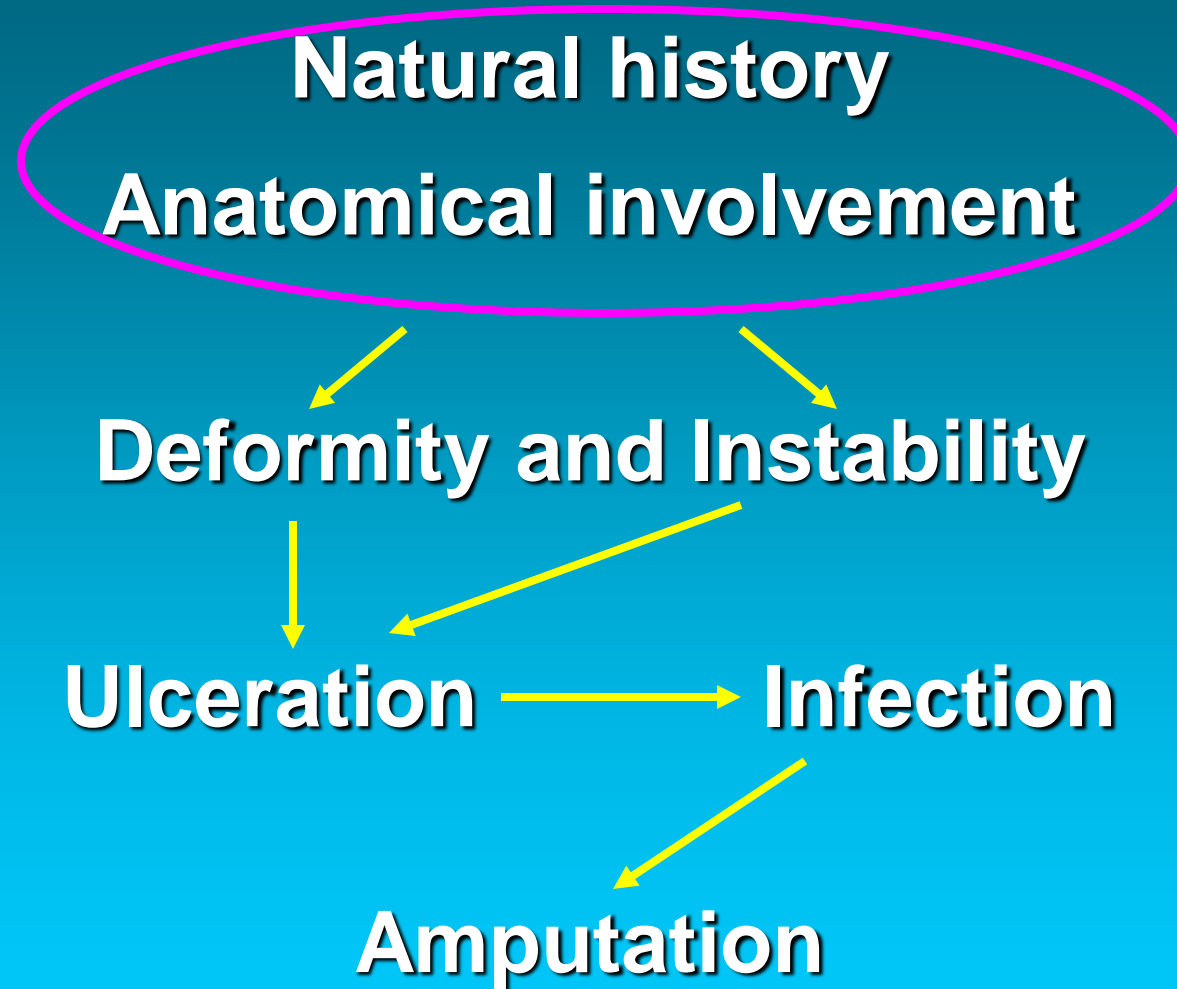
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# Summery

## Charcot



**Summery**

**Charcot**

**Early Diagnosis &  
Early Treatment**

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graph TD; A[Early Diagnosis & Early Treatment] --> B[Minimal Deformity and Instability  
Surgical Treatment]; B --> C[Plantigrade, stable, braceable foot];
```

**Minimal Deformity and Instability  
Surgical Treatment**

**Plantigrade, stable, braceable foot**

***Thank you !!***