The Diabetic Foot

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Pathophysiology of The Diabetic Foot

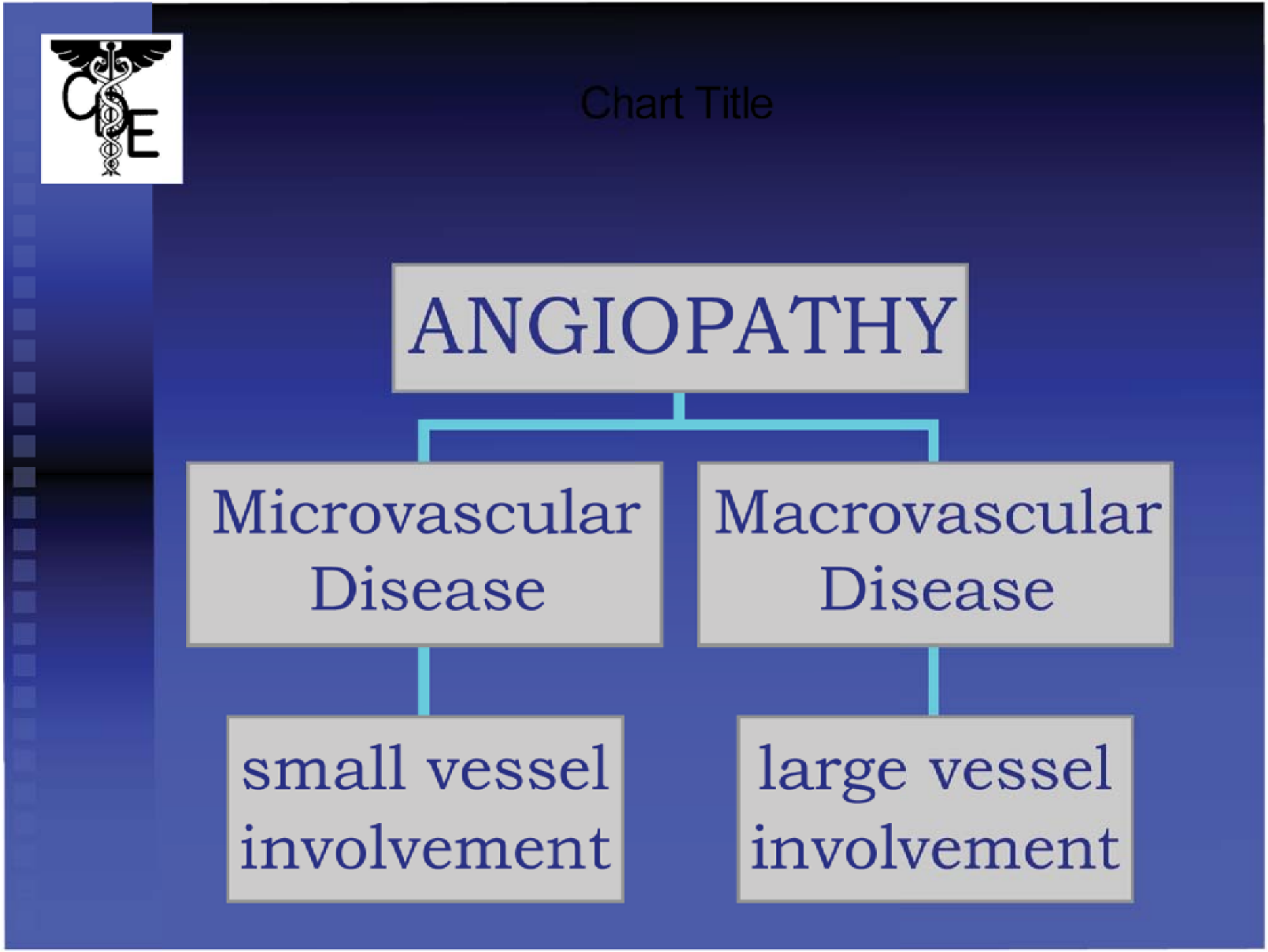
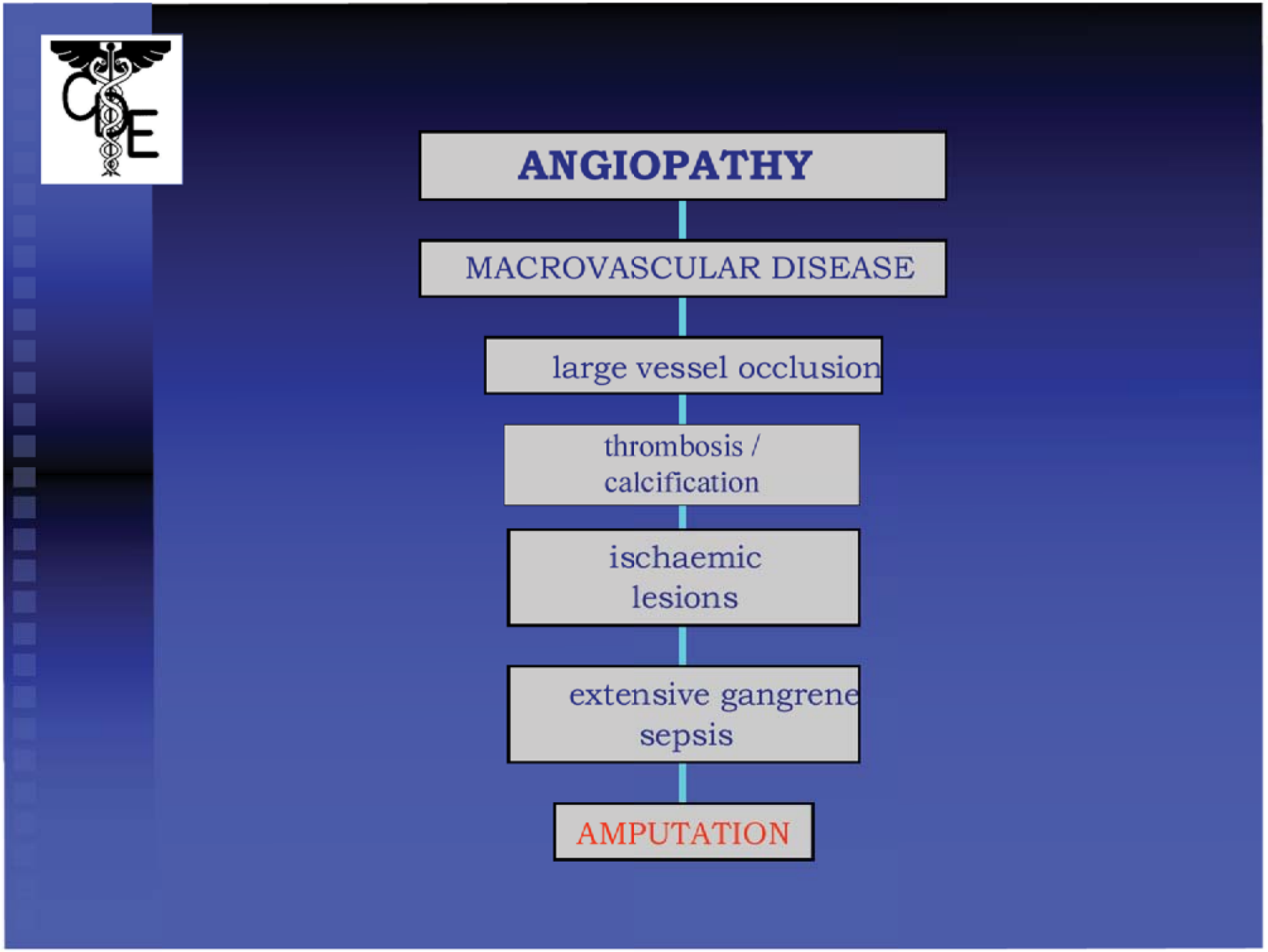


Chart Title
ANGIOPATHY
Microvascular Disease
Macrovascular Disease
small vessel involvement
large vessel involvement


ANGIOPATHY
MACROVASCULAR DISEASE
large vessel occlusion
thrombosis / calcification
ischaemic lesions
extensive gangrene sepsis
AMPUTATION

Arteriosclerosis
("Vascular Calcification")

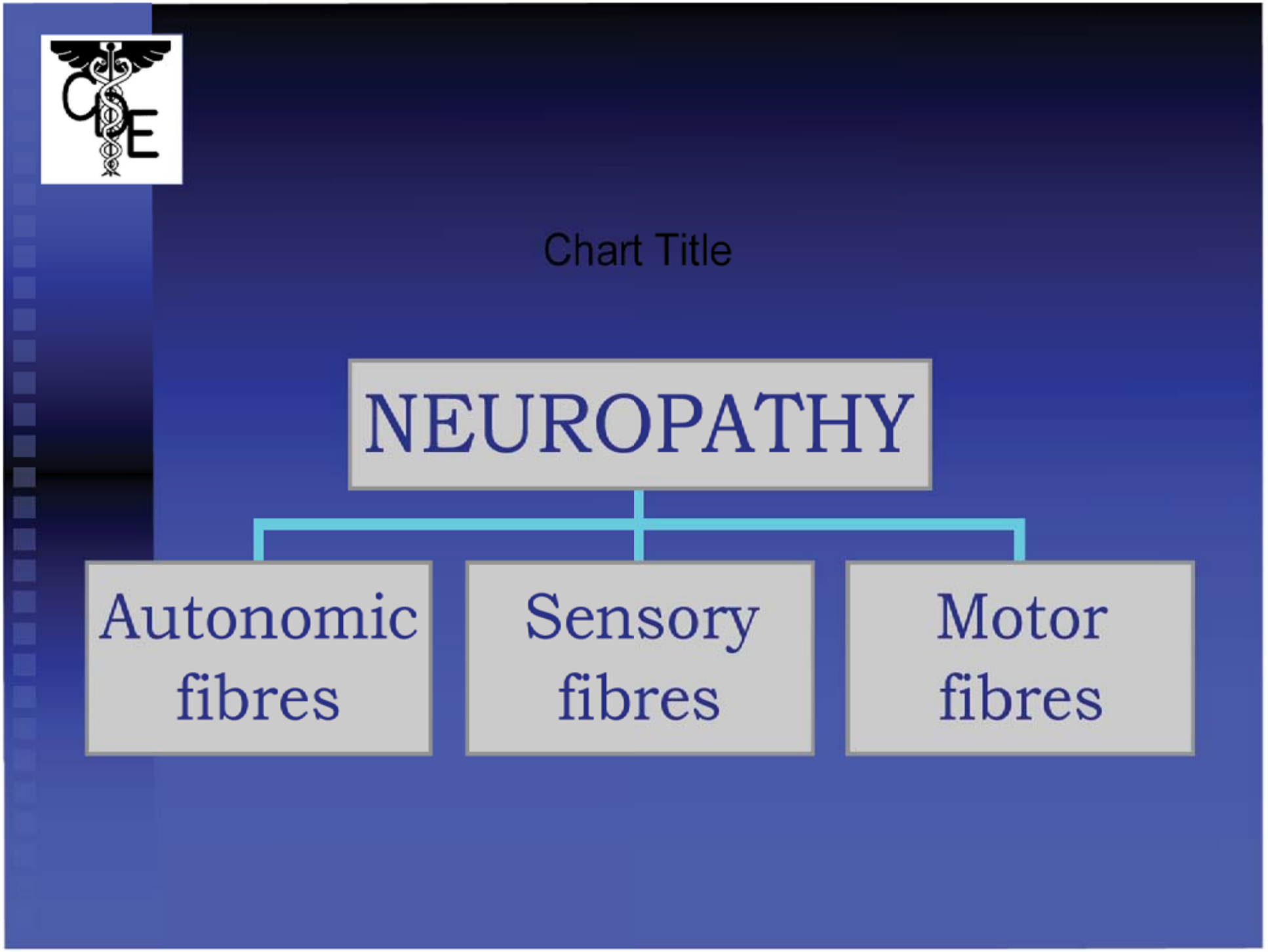


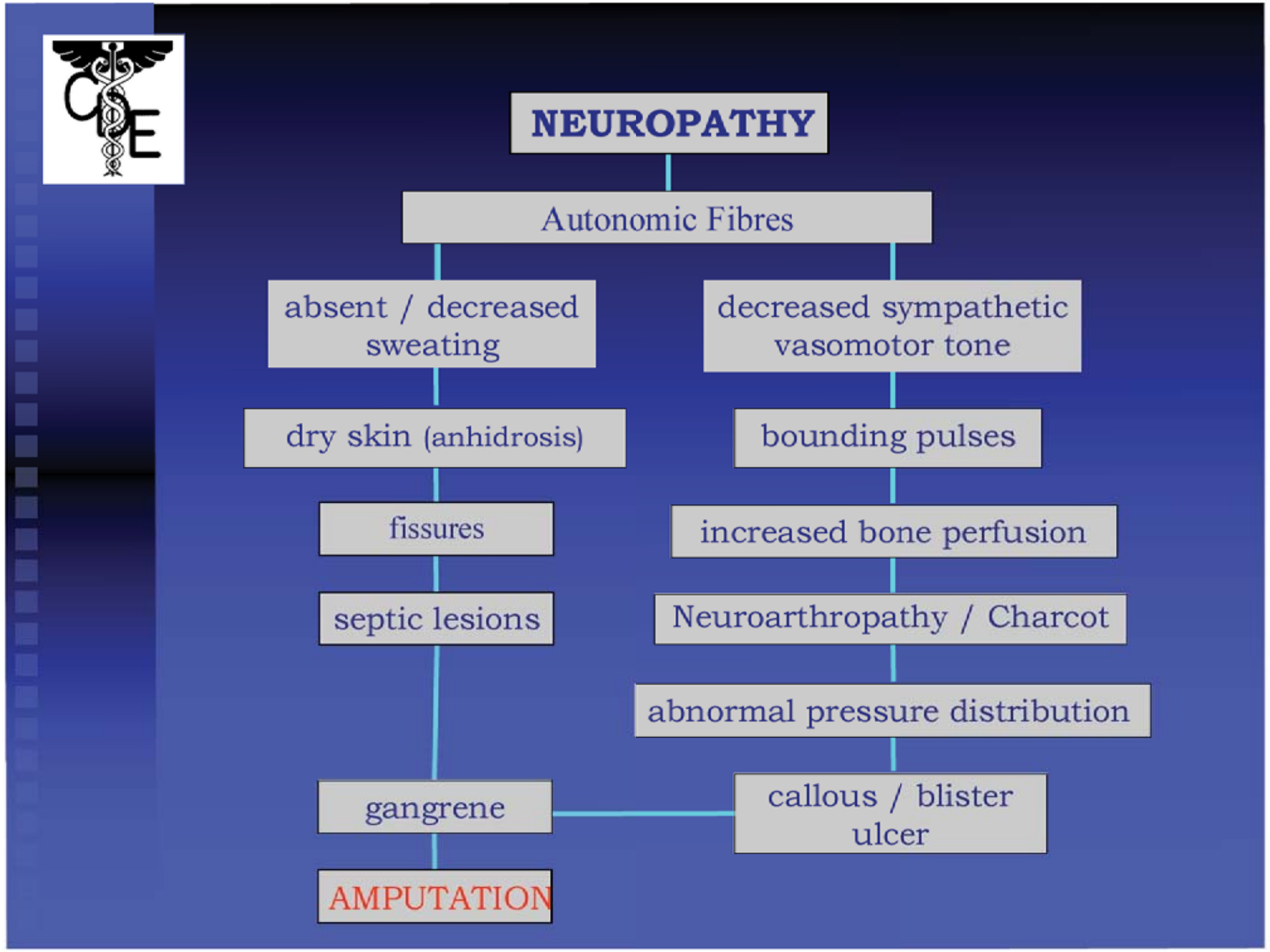
Chart Title
NEUROPATHY
Autonomic fibres
Sensory fibres
Motor fibres

Neuropathy

- 50% of patients affected
- 7% neuropathy at diagnosis of DM
- Increases with severity & duration of DM
- Male > Female
- Asymptomatic
- Symptomatic presentation most common >50 yrs
- 5–10% - Neuropathy from another cause

Distal Symmetric Polyneuropathy

- Most common
- Motor, sensory and autonomic functions are affected – sensory abnormalities predominant
- Presents as painful paraesthesias & numbness


NEUROPATHY
Autonomic Fibres
absent / decreased sweating
decreased sympathetic vasomotor tone
dry skin (anhidrosis)
bounding pulses
fissures
increased bone perfusion
septic lesions
Neuroarthropathy / Charcot
abnormal pressure distribution
gangrene
callous / blister ulcer
AMPUTATION

NEUROPATHY

Sensory Fibres

anaesthesia

loss of protective sensation

pressure/injury unnoticed

neuropathic ulcers

infection

gangrene

AMPUTATION

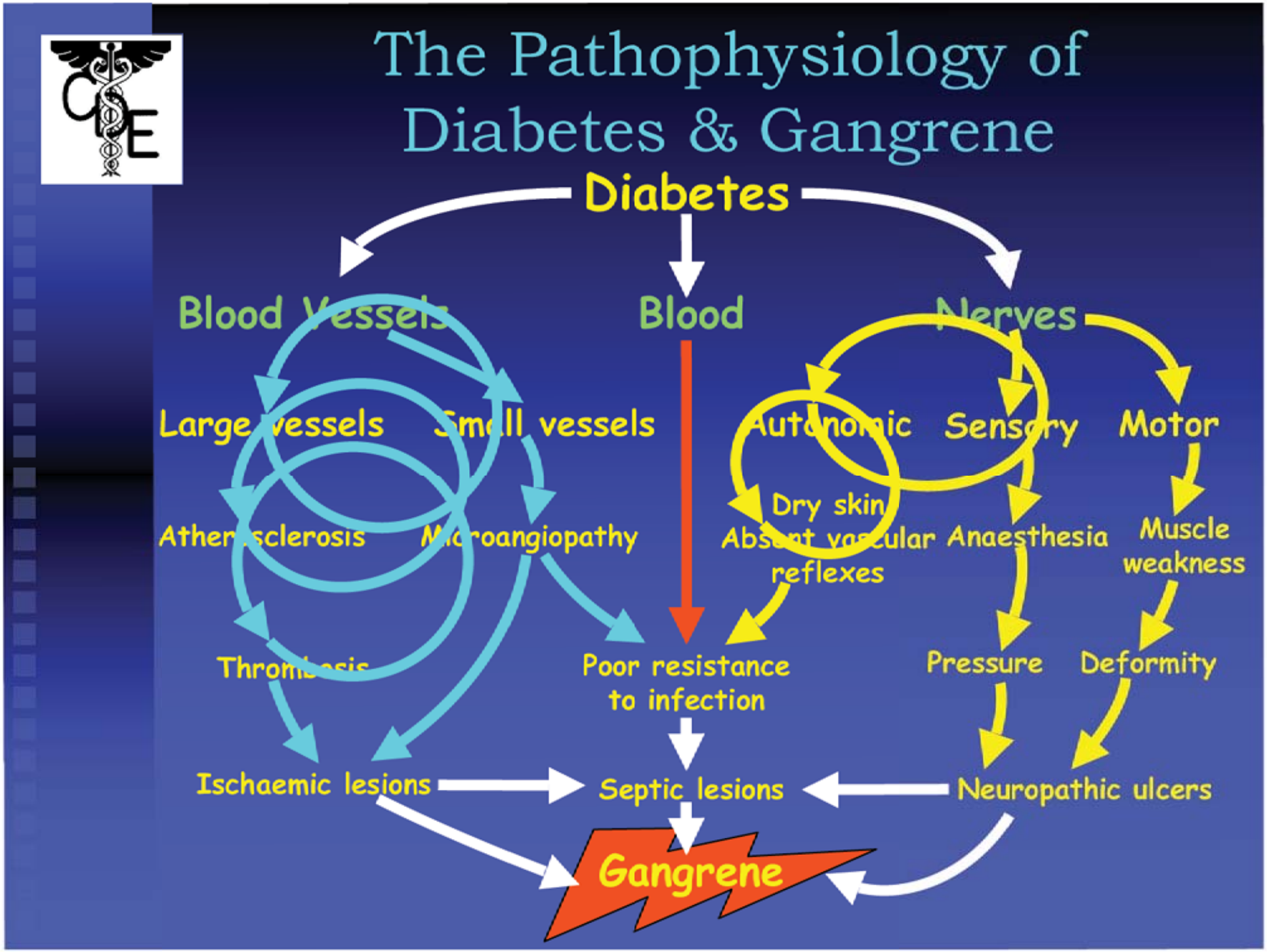
Don't Be Fooled!

The Consequences of "Neuropathy Unawareness"

Clawing of the Digits

From Callus to Ulcer

The Pathophysiology of Diabetes & Gangrene



Assessment of the Diabetic Foot

- History
- Simple inspection
- Palpation
- Sensory testing

Risk Factors

- Previous ulceration or gangrene
- Increasing age (50+ & 60+)
- PVD / Smoking
- Neuropathy
- Poor glycaemic control
- Structural deformity
- Duration of diabetes
- The irresponsible patient
- Other:
  - male sex
  - Retinopathy
  - Nephropathy
  - living alone

Assessment of the Diabetic Foot
Clinical Features

- Neuropathy
- Ischaemia
- Deformity
- Callous
- Swelling
- Skin breakdown
- Infection
- Necrosis

Clinical Manifestations of Large and Small Fibre Neuropathies

	Large Fibre Neuropathy	Small Fibre Neuropathy
Symptoms	Numbness, P&N, tingling, poor balance	Burning, electric shocks, stabbing pain
Exam	Reflexes, proprioception, vibration perception, 10g nylon monofilament	Thermal, pin prick sensation
Function	Pressure, balance	Protective sensation
	Sensory and/or motor neuropathies	Thermal perception, autonomic functions

Motor Neuropathy

- Classical signs:
  - High medial longitudinal arch
  - Prominent metatarsal heads
  - Pressure points over forefoot
- Other Signs
  - Foot slapping
  - toe scuffing
  - frequent tripping
  - Test dorsiflexion – foot drop secondary to common peroneal nerve palsy

Autonomic Neuropathy

- Classical signs:
  - Dry skin (sudomotor)
  - Distended veins (orthostatic hypotension)
- Other Signs
  - resting tachycardia
  - bowel/bladder dysfunction
  - Some degree of autonomic neuropathy in diabetic polyneuropathy
- Neuropad

Sensory Neuropathy

- Sensory symptoms can progress proximally in a glove like distribution
- Loss of sensation predisposes to development of foot ulcers and gangrene
- Sensory ataxia – impaired proprioception and vibratory perception

Negative Sensation: Painless Injuries

Modified Neuropathy Disability Score

Vibration perception threshold	Normal=0 Abnormal =1	R	L
Temp perception on dorsum of foot	Normal=0 Abnormal = 1		
Pin prick or sharp/blunt	Normal=0 Abnormal=1		
Achilles reflex	Present=0 Reinforcement=1 Absent=2		
NDS>=6 Increased risk of foot ulceration	Total out of 10		

Vascular Assessment

History

- Cold feet
- Claudication
- Rest pain
- Ulceration, infection, gangrene
- Previous surgery
- Smoking

Ischaemia

- Palpation of pulses:
  - Dorsalis Pedis
  - Posterior Tibialis
- Ankle Brachial Index (SBP)
  - >1 = normal
  - <1 = Ischaemia
  - < 0.5 severe ischaemia
- Problem: medial arterial calcification
- Pattern of waveform: reduced forward flow / Damped / Monophasic

Tests (Vascular)

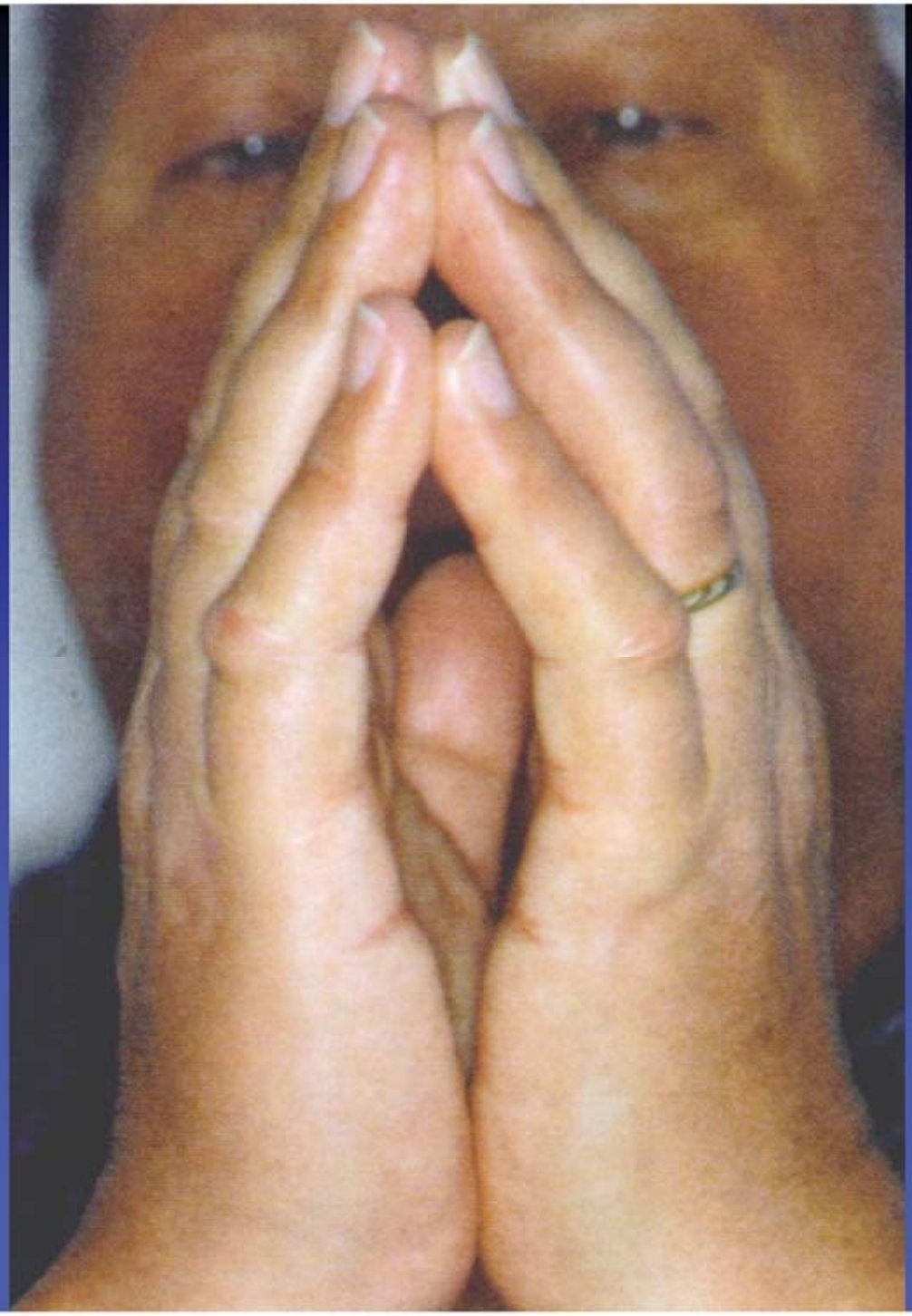
- Capillary refill time
- Colour
- Skin and subcutaneous tissue atrophy
- Hair growth and nail appearance
- Skin Temperature

Orthopaedic Evaluation

Limited joint mobility

Deformities

- Bunions (HAV)
- Bony deformity
- Lesser toe deformity
- Charcot arthropathy

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Callous

- Develops at sites of
  - pressure
  - shear
  - friction
- Forerunner of ulceration in the presence of neuropathy

Swelling

- Major factor predisposing to ulceration
- Exacerbates a tight fit inside poorly fitting shoes
- Impedes healing
- Bilateral: Cardiac failure, Renal impairment, venous insufficiency, neuropathic oedema
- Unilateral: infection, Charcot foot, gout, DVT, trauma, localised collection of pus

Skin Breakdown

- Search for breaks in skin over entire surface of foot
- Lesions may not always be obvious:
  - Discharge
  - Colour changes
  - Pain
  - Swelling
  - Warmth
  - Erythema

Infection

- Purulent discharge
- Erythema
- Swelling
- Warmth

Necrosis

- Regions of breakdown progress to underlying necrosis
- Black or brown devitalised tissue