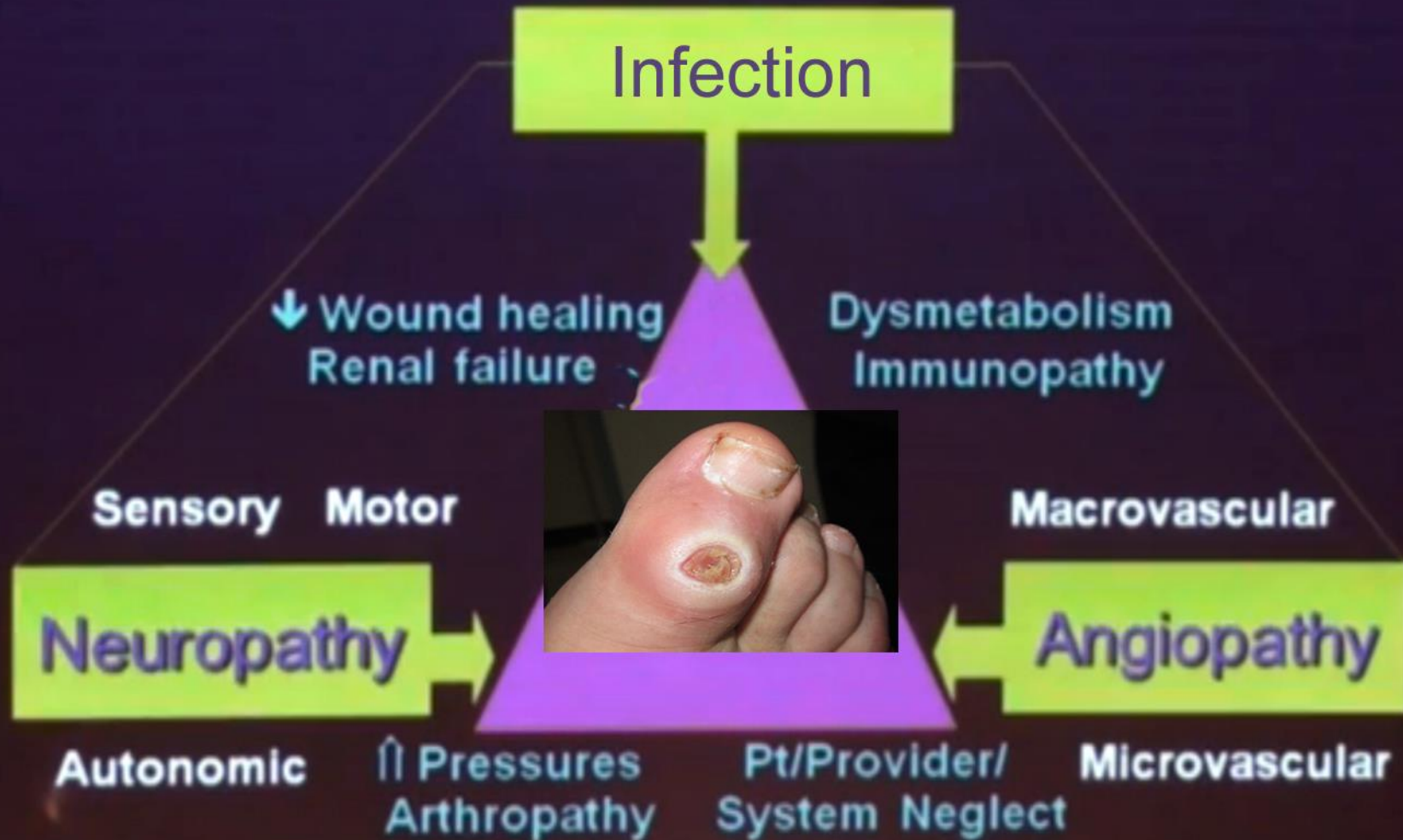


# Preventing Amputations

In the Lower Extremities  
Of Patients With Diabetes



# Major Contributors to Diabetic Foot Disorders



# Several “steps” take place prior to the loss of a limb.

The six steps are:-

- ▶ Diabetes,
- ▶ Neuropathy
- ▶ Ulceration
- ▶ Vascular disease
- ▶ Infection and amputation.



Each of these steps is preventable and one can take action to prevent the patient from escalating to the next step.

# Treatment - Multifocal Approach

- ▶ Thorough history
- ▶ Optimising glycaemic control
- ▶ Vascular supply ~ ABI = 0.45 referral
- ▶ Aggressive wound debridement
- ▶ Infection control
- ▶ Maintaining wound moisture control
- ▶ Appropriate offloading

# Diabetes Foot Screening and Risk Stratification Tool

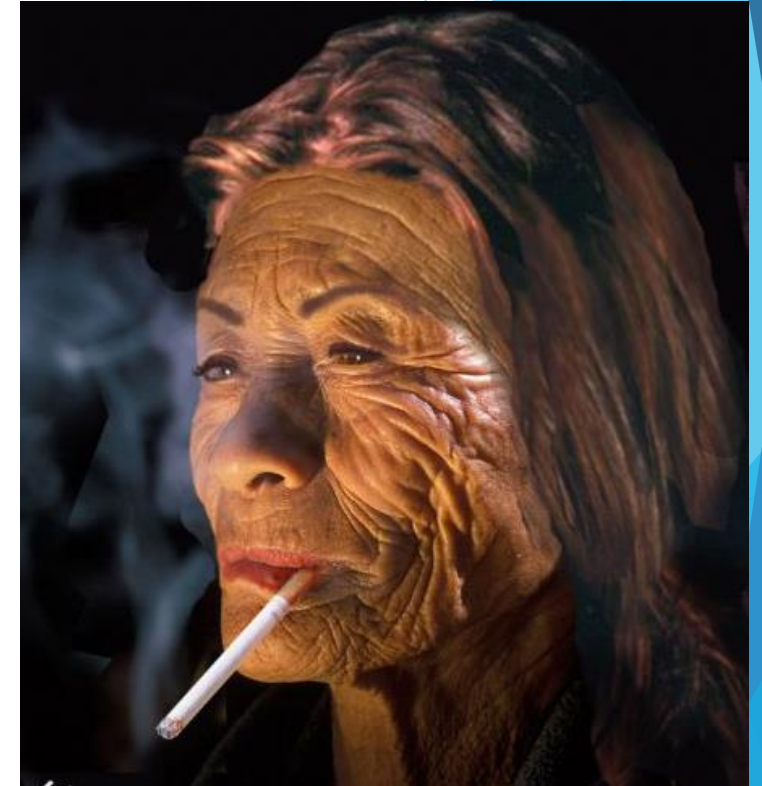


# Glycemic Control & vascular stasis

- ▶ Control blood glucose -imperative healing chronic wounds.
- ▶ Hyperglycemia results - leukocyte dysfunction, suppression lymphocytes.
- ▶ Requires adequate tissue oxygenation
  - = well vascularized wound bed
  - = new granulation tissue

# Smoking

- ▶ Smoking greatest impact on PAD
- ▶ Cessation is the cornerstone of PAD treatment





# Caution Debridement

- ▶ Surgical debridement - inappropriate for ulcers with vascular insufficiency -extreme Caution  
On patients on anticoagulants.





# Emphasizing The Value Of Risk Stratification and Preventative measures.

- ▶ Frequency visits depends on the severity of the abnormality and the degree of intervention necessary to control ulcer risk.
- ▶ Some hemorrhagic keratosis require weekly, biweekly - monthly.
- ▶ Debridement is extremely effective preventing ulceration.
- ▶ infection, hospitalization and amputation.



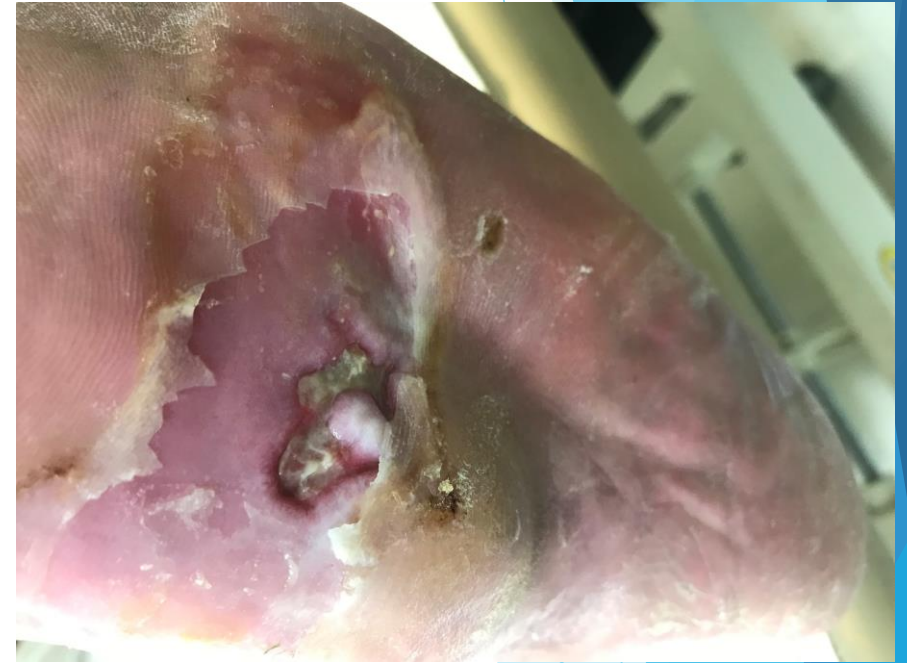
# Compromised sensory perception

- ▶ L.O.P.S - localized pressure, leading to tissue ischaemia and ulceration.
- ▶ PN- high risk impaired balance and gait.
- ▶ Loss somatosensory afferents from peripheral neuropathy =increased risk ulceration balance and gait control.



# Initial Care for referred patient

- ▶ Vascular - if pedal pulses are not palpable , we order non - invasive arterial studies and obtain vascular consult based results.
- ▶ Neurological exam.
- ▶ X-ray rule out osteomyelitis and assess deformity that might be contributing to the wound.
- ▶ Infection antibiotic management.



# The Effects Of ESRD On Patients With Diabetes

- ▶ Dialysis is an independent risk factor for ulceration.
- ▶ A 2x increase in the prevalence of other lower extremity complications such as peripheral arterial disease (PAD) and amputations in dialysis-treated patients.
- ▶ Found an increase in foot ulcerations in patients with ESRD.
- ▶ A 4X increase in diabetic foot complications, defined as infection, gangrene and amputation.



## *End-stage renal disease (ESRD)*



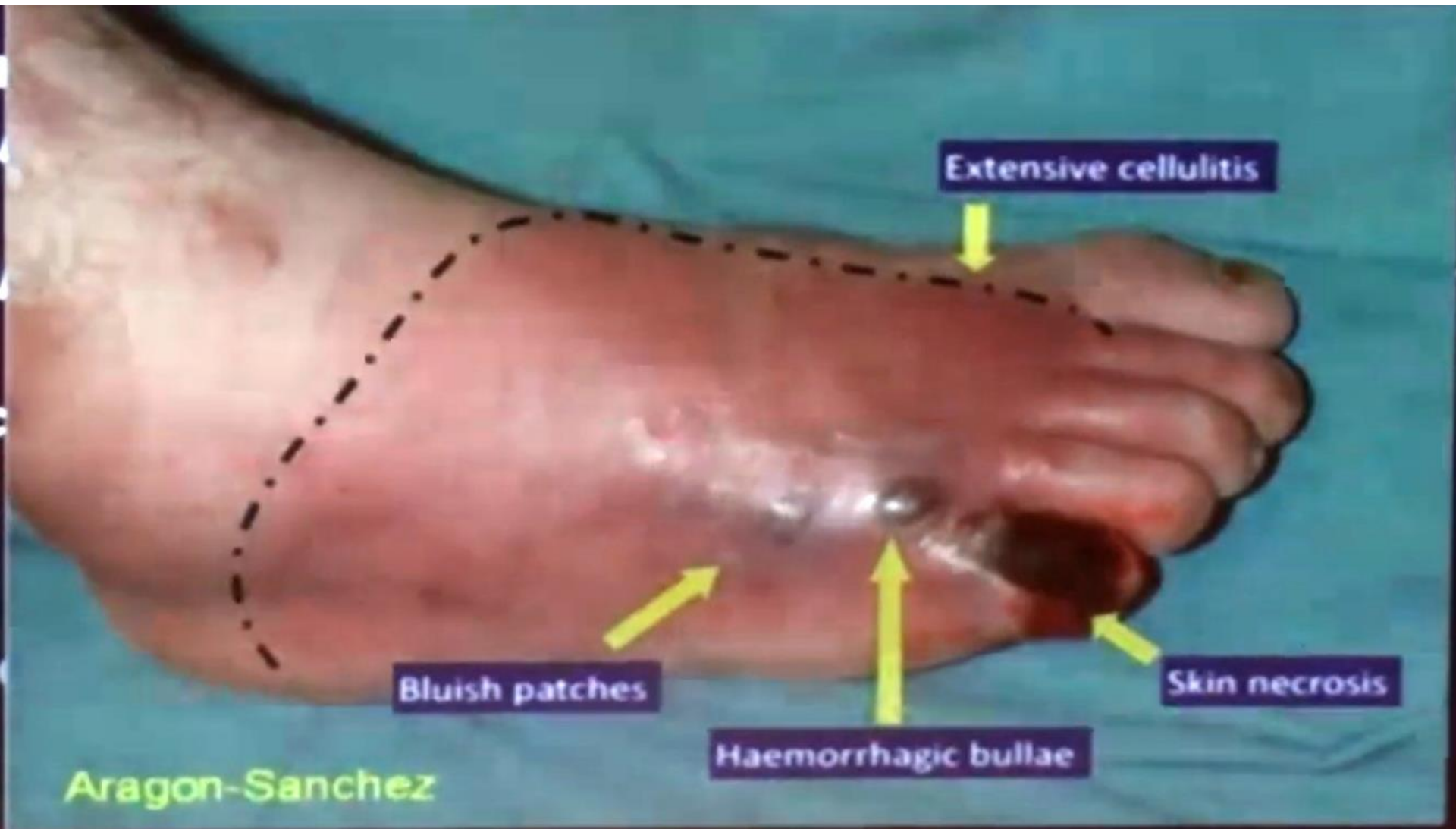
- ▶ Kidney disease increases the risk of peripheral arterial disease (PAD) 3X in comparison to patients without renal disease but the severity of PAD worsens as kidney disease progresses.



# The Effects Of ESRD On Patients With PAD

- ▶ Calciphylaxis is a thrombolytic event that provokes ischaemia and tissue infarction.
- ▶ Common lower extremities.
- ▶ Begin painful red areas that develop into indurated plaques followed by eschar, ulceration and gangrene.
- ▶ One year mortality rate > 50% often 2<sup>nd</sup> to sepsis deriving ulcers.











# Diagnosing DFO: Current Methods

## Clinical (for osteomyelitis)

- History: long wound duration, recurrent infection
- Exam deep large( $>2\text{cm}^2$ ) ulcer, bony prominence, visible bone/joint, “sausage” toe
- Probe-to bone: useful if done and interpreted correctly
- Blood tests: WBC, ESR, C-RP, ? Biomarkers



# Clinical Classification Diabetic Foot Infection

Clinical Manifestations*	IDSA Severity	IWGDF PEDIS	
No purulence or inflammation (erythema, pain, warmth, tenderness, or induration)	Uninfected	1	
Infected( $\geq$ signs/sx inflammation) But erythema $\leq$ 2cm around ulcer, infection limited to skin or superficial subcutaneous tissues	Mild	2	
$\geq$ 1 of following: cellulitis $>$ 2cm Lymphangitis; subQ spread Deep abscess; gangrene; Muscle, tendon, joint or bone involved	Moderate	3	
Systematic toxicity or metabolic instability	Severe	4	

# Motor neuropathy

- Atrophy of the short extensor muscle.
- Atrophy of the intrinsic muscles of the arch.
- Hammer toe deformities
- Hallux valgus deformity
- Gait instability
- Falls



# Diabetic Motor Neuropathy



Charcot feet - heel walk - cannot raise toes  
Tibialis anterior weakness- Foot slap



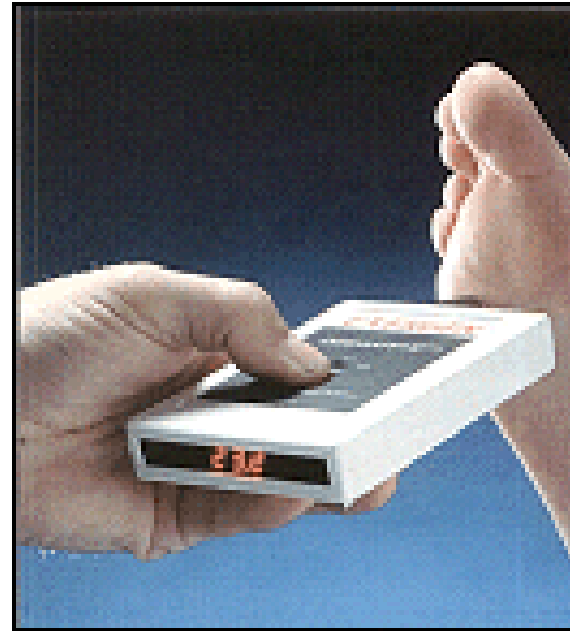
# Inactive Charcot Foot



When there is no inflammation it is inactive

# Thermography

- ▶ Diagnosis of Charcot's foot is supported, where available, by the use of thermography, which will show a skin temperature of 2-8°C higher than the contralateral foot.



# Early Active Charcot

- ▶ Misdiagnosis
  - ▶ Cellulitis, Gout, Deep venous





# Evaluating Equinus



Silfverskiöld Test

# Equinus

- ▶ Equinus - the most profound casual agent in foot pathomechanics
- ▶ Life threatening
- ▶ significantly increases risk of diabetic foot ulcer

Refer orthopaedic surgeon  
Diabetic foot clinic



# Equinus Treatment

- ▶ Debridement wound
- ▶ Offloading - moonboot
- ▶ Tendo-achilles lengthening to heal a diabetic fore-foot ulcer
- ▶ Refer orthopaedic surgeon for surgery options
- ▶ Conservative prior ulceration - manual stretching - night splints



# Equinus Treatment



# Neuropathic Diabetic Wound

- ▶ One should initially consider the “VIPs” (vascular, infection and pressure).
- ▶ Increased plantar pressure is a common reason for non-healing of ulcerations. Equinus deformity





# Diabetic neuropathic wound



- ▶ Damaged nerve impulses control muscles ie motor nerves.
- ▶ Pain , touch or positional sense ie sensory nerves.
- ▶ As a result of peripheral neuropathy they may develop other sequelae, including an increased risk of falling.

# Ulceration

This is due to loss of plantarflexory function of the gastrocnemius muscle and subsequent overload at the plantar heel in gait.

- ▶ An ankle foot (AFO) or orthotics with extra - depth shoe can be appropriate in some cases
- ▶ Meticulous wound management, including debridement. Vascular surgeon consult - revascularization.
- ▶ The knee walker scooter moonboot.
- ▶ AFO - orthotics modification remains healed.





# Ulceration - treatment



# Digital amputation significant indicator of future leg loss



- ▶ Loss digits alteration of osseous architecture of foot, resulting in changes pressure location new areas osseous prominence >PRESSURE - ulceration -infection AMPUTATION.
- ▶ Multiple hospitalizations and re -operations

# Preventing Diabetic foot Recurrence

After achieving healing

- ▶ Appropriate shoe gear
- ▶ Orthotics or bracing to help prevent recurrence
- ▶ Therapeutic footwear in those with severe foot deformity
- ▶ Refer surgeon
- ▶ Distal toes tenotomy
- ▶ Charcot reconstruction
- ▶ Achilles lengthening

I frequently get orthotics to get rocker soled shoes, metatarsal pads and accommodation under the affected areas.

# Emphasizing appropriate Shoe gear And Patient Education



- ▶ Evaluation and management of minor trauma triggers like foot deformity, pressure callus and undetected injury may prevent amputation
- ▶ Encourage compliance with diabetes control
- ▶ Emphasize the importance of visual foot exams at home.

# Emphasizing appropriate Shoe gear And Patient Education

- ▶ Pressure relieving shoes and orthotics help lower risk amputation
- ▶ Educate patients every visit
- ▶ Explain the potential impact of neuropathy



# Current interventions to address gait and balance diabetic peripheral neuropathy

improve the motor control of gait and balance for patients to walk safely.

- ▶ Physiotherapy - guided training
- ▶ Postural control training
- ▶ Custom insoles - enhance balance control in individuals with neuropathy.

There is a need to improve, restore or replace inputs regarding plantar pressure proprioception to





# SurroGait Rx

- ▶ Wearable technology has a potential benefit high-risk population.





# Treatment

- ▶ Offloading the wound.
- ▶ Surgical shoes
- ▶ Casts TCC
- ▶ Crutches
- ▶ Walkers
- ▶ Wheelchairs

# Flexor tenotomy - distal tip toes diabetic neuropathy

- ▶ A full thickness ulcer 4x6mm, a slight hyperkeratotic rim with red granular base positive probing bone
- ▶ Radiographic findings cortical disruption -concern osteomyelitis
- ▶ Oral antibiotics started.
- ▶ The triad of diabetic neuropathy
- ▶ Hammertoe deformity and repetitive trauma resulted ulceration in this patient
- ▶ Digital amputation most common foot amputation - eradicate infection



# Subungual squamous cell carcinoma of the nail bed.

- ▶ Presentation fingernail and a linear pigmented streak below right hallux nail plate.
- ▶ Dermatologist review - following day placed dermatology clinic.
- ▶ Review radiographs for underlying osseous change.



# Subungual squamous cell carcinoma of the nail bed.

- ▶ Nail plate avulsion and 3mm punch biopsy.

This case study remains under review as nail bed abnormality high risk non-healing with her diabetes and confirmation of pathology dermatologist - benign.

In discussion dermatologist high risk - rerefer

Urgent review change pigment change nail matrix.



# Decision to perform phenol matrixectomy

- ▶ Level pain, presence infection, erythema , edema, granulation tissue and drainage. Risk of sinus nail sulcus which may go undetected -soft tissue infection and osteomyelitis of distal phalanx may occur.
- ▶ Treatment - prophylactic antibiotic cover. Pedal pulses, resolve infection prior treatment.
- ▶ Conservative treatment failed review patient history. Diabetes,pvd,meds,



# Conclusion

- ▶ Research has shown that multidisciplinary teamwork, the addition of a podiatry service, prescription footwear and home temperature monitoring can prevent diabetic foot ulcers and amputation.
- ▶ Prevention of foot complications in diabetes is key in improving the patient's quality of life, reducing mortality and lowering healthcare costs.



Thank-you - Jacqui Journeaux



Put your  
best foot  
forward.