ABC's of Diabetic Foot Care

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Objectives

- Apply comprehensive assessment skills in the diabetic foot.
- Identify appropriate treatment modalities
- Review steps in prevention of wounds
- Case Scenarios/Discussions

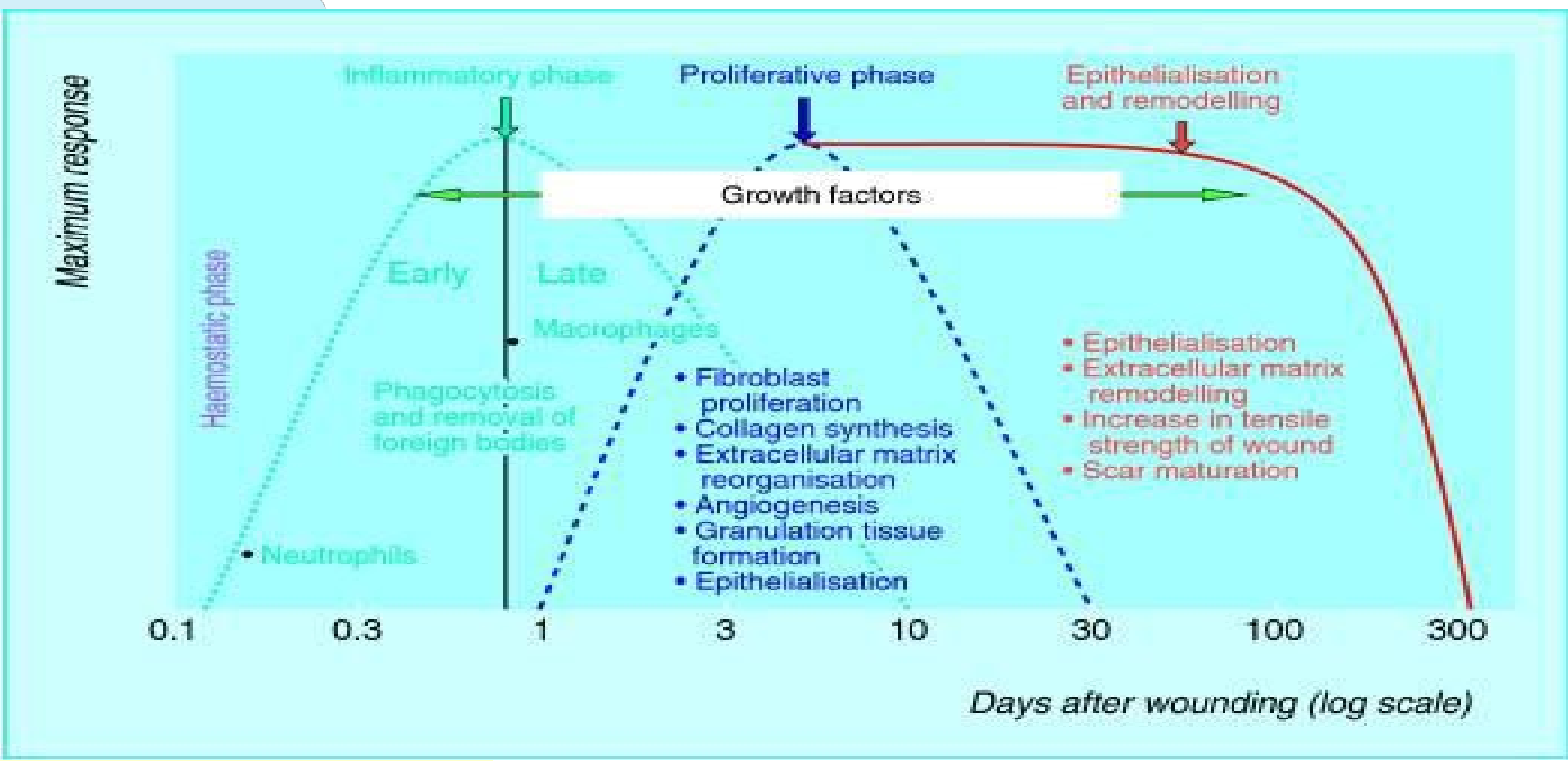
Diabetes Statistics

- Diabetes kills more people annually than breast cancer and AIDS combined. *American Diabetes Association , 2009*
- Half of people with diabetes don't know they have it. *American Diabetes Association/International Diabetes Fed.*
- Quiet. Slow. Deadly. Expensive: Chronic Diseases Account for 75% of our Healthcare Costs. *CDC*
- 25% of all medical care is consumed by 1% of the population and nearly 50% is consumed by 5%. *AHRQ, 2013*
- One Day with Diabetes in the USA: $670 million in cost, 5000 newly diagnosed, 280 lives, 180 limbs. We can do better. Today. *American Diabetes Association, 2014*
- Seconds Count: Every 7 seconds someone dies from diabetes. Every 20 seconds someone is amputated. *International*
- *Approximately 23.6 million Americans (7.8%) and 246 million people worldwide (5.9%), have diabetes mellitus. Complications include heart disease, stroke, hypertension, renal disease, retinopathy, peripheral artery disease, and peripheral neuropathies.*

Diabetic statistics

- The cost of diabetic foot ulcers is greater than that of the five most costly forms of cancer. *Barshes, et al, 2013*
- Peripheral neuropathies can lead to an insensate foot, nonhealing foot ulcers, and an increased risk for amputation.
- Diabetic Foot Ulcers are twice as costly to US Medicare as those with Diabetes alone. *Rice, et al, ISPOR, 2013*
- *The global economic burden of diabetes was estimated to be 1.31 trillion and 2015, with nearly 35% the results of indirect contrast, such as labor force dropout due to mortality and morbidity, according to WHO data. May 1, 2017 David Armstrong.*
- More than 90% of people with diabetic peripheral neuropathy are unaware they have it. *Bongaerts, et al, Diabetes Care, 2013*
- More than 60% of nontraumatic lower-limb amputations occur in people with diabetes.
- In 2006, about 65,700 nontraumatic lower-limb amputations were performed in people with diabetes. - http://www.diabetes.org/diabetes-basics/statistics/#sthash.ux7Io9bf.dpuf

Cellular and Bio-physiological Events in Normal Wound Healing



Acute & Chronic Wound Differences

Acute Wounds

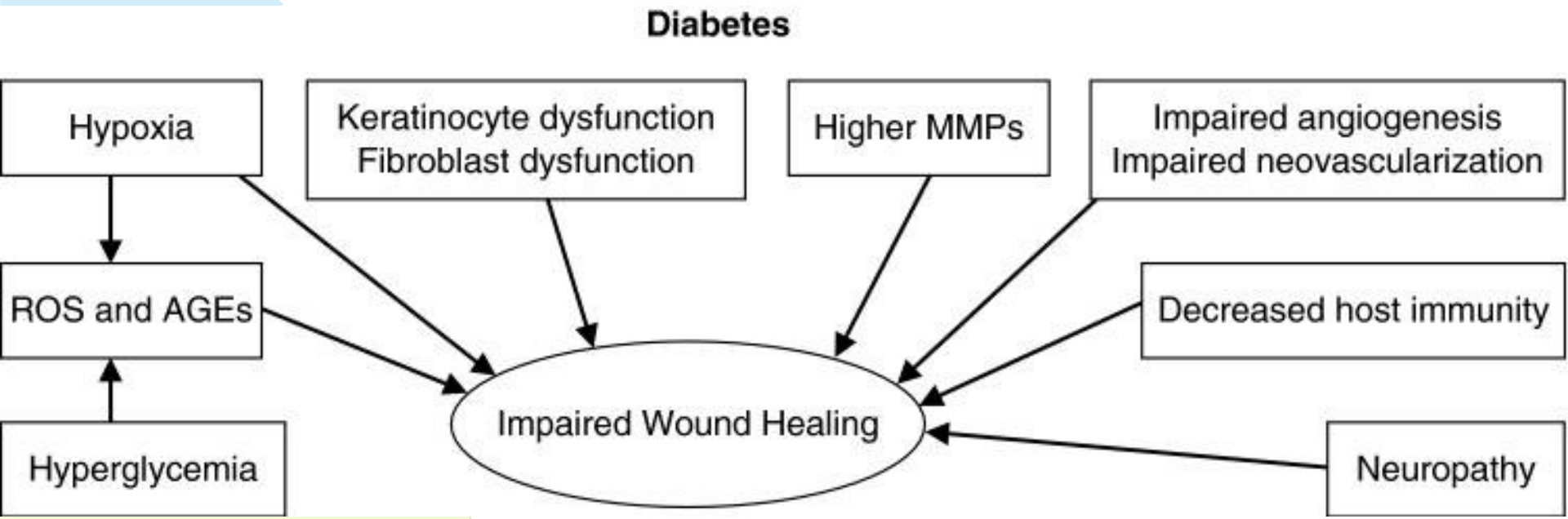
- Low necrotic burden
- Low bacterial burden
- Low exudation
- Low senescent cells
- Low matrix metalloproteinase (MMPs)*
- Often revitalized by one debridement

Chronic Wounds

- High necrotic burden
- High bacterial burden
- High exudation (chronic wound fluid)
- High MMPs*
- May require maintenance debridement

MMPs are a family of protein degrading enzymes

Diabetes Effects on Wound Healing



Foot Care

- The scope for the foot and nail care nurse is regulated by each state's nurse practice act.
- Know your Scope of Practice depending on Profession. Nurse, Physician, PA, NP, Podiatrist, aide, patient care tech etc.
  - If you do not know ask and contact evidence based resources.
- Some states or facilities may require a provider's order for nail debridement, while other states do not.
- Clinical practice settings also very based on community needs and resources.

Scope of Practice

Care may include:

- Screening and referral, hygiene and routine skin care
- Advanced interventions such as nail debridement, callus reduction, padding, off-loading, and wound care.

“None of us
are as smart
as all of us” -Ken Blanchard

Foot Care

- Assessment, hygienic skin and nail care, interventional skin and nail care, patient education and referral.

Goal of Foot Care

- Prevention of thermal, mechanical and chemical injuries to the feet
- Early detection of foot and nail problems
- Maintenance of skin and nail integrity or referral when indicated
- Enhancement of patient self-care and monitoring skills.

Early Detection is Key

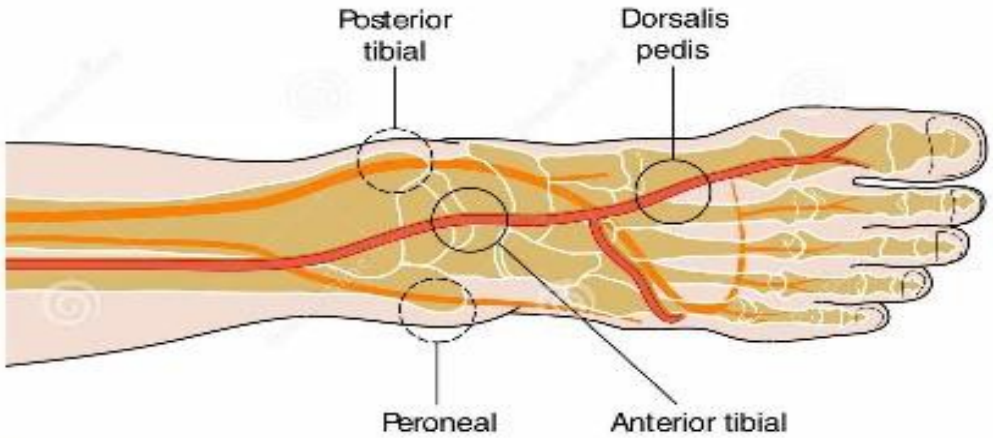
- Simple foot exam
- 3 minute exam

Assessment

- Hx. Review of disease processes, previous foot problems, medications and home remedies or current treatment.
- Self care deficits, vision, arthritis, obesity or cognitive deficits
- Incorporates inspection and palpation
- Condition of skin and nails, perfusion and sensorimotor function
- Skin is assessed for temperature, presence of hair, integrity, calluses, edema, erythema, and discoloration
  - Between toes-moisture, cracks, fissures etc
  - Nails for thickening, subungual debris, discoloration and nail folds

Circulation

- Palpation of pulses
- Skin temperature, color, hair, edema, and capillary refill.
- Pedal sensations
- Always wearing socks, properly fitting shoes, checking shoes
- Muscular Strength
- The foot is inspected for bunions, hammertoes, claw toes, or Charcot deformity



Skin Assessment Components

Atrophic changes

- Shiny, hairless extremities
  - Recommend vascular consult
- Structural changes of the foot

Does the Shoe Fit

Skin Assessment Components

Review sensory status

- Intact or altered
  - Location
  - LOPS (loss of protective sensation), two point discrimination, heat/cold, deep pressure, pin prick, vibration
    - Sensory- insidious
    - Motor
    - Autonomic

"Loss of protective sensation is a major component of nearly all DFUs.[1] It is associated with a seven-fold increase in risk for ulceration[1]"

Diagnostic tests for diabetic peripheral neuropathy include:

Diagnostic tests for Diabetic Peripheral Neuropathy include:

Vibration perception tested with tuning fork

Monofilament screening test

Nerve conduction velocity measurements

Risk for Lower Extremity Amputation

TABLE 4.

Risk Categories for Lower Extremity Amputation[a,b]

Risk Category	Description
0	No loss of protective sensation in feet
1	Loss of protective sensation in feet
2	Loss of protective sensation in feet with high plantar pressure (callus or deformity) and/or poor circulation
3	History of plantar ulceration or neuropathic fracture (Charcot)

[a]Loss of protective sensation is assessed using a 5.07 monofilament at a minimum of 4 locations on each foot.
[b]US Department of Health and Human Services.[21]

Comprehensive Management Guidelines Based on Risk Category

TABLE 5.

Comprehensive Management Guidelines Based on Risk Category[a]

Risk Category	Follow-up Visits	Self-inspection	Insoles	Footwear	Patient Education
0	Yearly[b]	Daily	Optional	A well-fitting shoe	Every visit
1	Every 6 mo[b]	Daily	Non molded soft insert	Off the shelf with low heels soft soles, adjustable closures. Extra depth in toe box	Every visit
2	Every 3 mo	Daily	Molded custom orthoses	Extra depth in toe box Rigid rocker soles	Every visit
3	Monthly	Daily	Molded; custom orthoses	Extra depth Custom molded shoes Rigid rocker soles ankle/foot orthoses	Every visit

[a]From Hoard & Hupp and Brasseaux.[26,27]
[b]More frequent visits are required if patient requires nail and callus care.

Skin Assessment Components DERMATOLOGICAL

Describe integrity

Edema

Review sensory status

Moisture

Atrophic changes

Turgor/texture

Observe nail composition/hair quality

Look/feel color and temperature variations

Observe skin folds

Geronto-dermatological changes

Inquire about allergies and previous medical history

Callus

Assess vascular status

Lesions (rashes, scars, bruising, hemosiderin, nevi etc)

Nail Debridement

- Clippers
- Orange stick
- File
- Fine curette
- Stainless steel diamond nail file

Before and After

(a)

(b)

Mycotic and Dystropic nails

- high-velocity electric podiatry file with a variety of burrs.

Callus Reduction

- Electric podiatry file
- Pumice stone
- Emery board depending on the size and thickness of the callus

Callus

- Indicates area(s) of high pressure or repetitive stress/ trauma

Callus

Padding and Cushioning

- Silicone jell or foam
- Lambs wool
- Non-adherent silicone pads
  - Adhesive pads should be avoided to the skin but could be applied to the insoles.

Pressure Reducing Strategies

- Total Contact Cast
- Removable Cast Walkers
  - CROW boot
  - DH walker
  - Prefab walker
  - Patella Tendon Bearing brace (PTB)
- Wedge shoes
- Multi-Podus splint boot
- Surgical shoes or shoes with pressure relief insoles
- Healing Sandals
- Crutches, Walkers and wheelchairs
- Orthotic

Infection Control and Self Care

- Disinfected or sterilized instruments and single-use items
- Personal protective equipment, gloves, disposable gown and cap when using electric podiatry file or electric podiatry suction, eye protection (with magnification if required) and single-use disposable respirators, or the N-95 mask with disposable filters, reduce exposure to microbial dust.
  - Eye protection (with magnification if required) and single-use disposable respirators, or the N-95 mask with disposable filters, reduce exposure to microbial dust. These precautions are necessary because the nurse may inhale dust containing microbials when reducing calluses and nails leading to rhinitis or asthma.
- Evidence-based risk management strategies to minimize exposure to nail dust include effective and efficient dust extraction systems, proper maintenance of equipment, appropriate drilling technique, education and training, and personal protective equipment.
- Patient positioning
- Rest/ stretching

Proper Attire

Cleansing Tools

- Sanitize
- Disinfect
- Concentration of solution
- Contact time
- Sterilize
- Autoclave

What do you do?

Classification & Staging of Diabetic Ulcers

- The diabetic foot is classified on the basis of etiology
  - Wagner's classification of diabetic ulcer
  - University of Texas Diabetic Foot Classification System

Identify Cause

- Determine and eliminate source
- Assess blood flow
  - Assess vascular status, Color and temperature changes
    - Doppler, ABI, toe pressures
    - Palpate pulses, capillary refill
    - Toe pressures
- Look, listen, touch, smell
- Referrals to appropriate providers
- Identify goals of wound healing
- Debride callus
- Treat infection
- Cleanse-**WOUND CLEANSING** May not be ordered, ALWAYS necessary removes bacteria, surface contaminants, residual dressing, protects the healing wound
- Choose appropriate topical treatment

Risk Factors for Infection

- A positive probe-to-bone test
- DFU present for more than 30 days
- A history of recurrent DFU's
- A traumatic foot wound
- The presence of PAD in the affected limb
- A previous lower extremity amputation
- Loss of protective sensation
- The presence of renal insufficiency
- A history of walking barefoot

If infection suspected, take appropriate cultures, preferable soft tissue (or bone when osteomyelitis is suspected and proper referals

"Treat the ***WHOLE*** patient- Not just the ***Hole*** in the patient"

Risk Factors, Treatment and Prevention

- Treat the Underlying Disease Process
  - Optimal Diabetes Control
  - Treat ischemia
  - Restoring Pulsatile Blood Flow
  - Address neuropathy
- Address physical cause of trauma
- Effective Local Wound Care
- Infection Control
- Pressure Reducing Strategies
- Bioburden
- Smoking
- Nutrition
- Medications that affect healing

Moisture balance: Optimal Dressing Selection

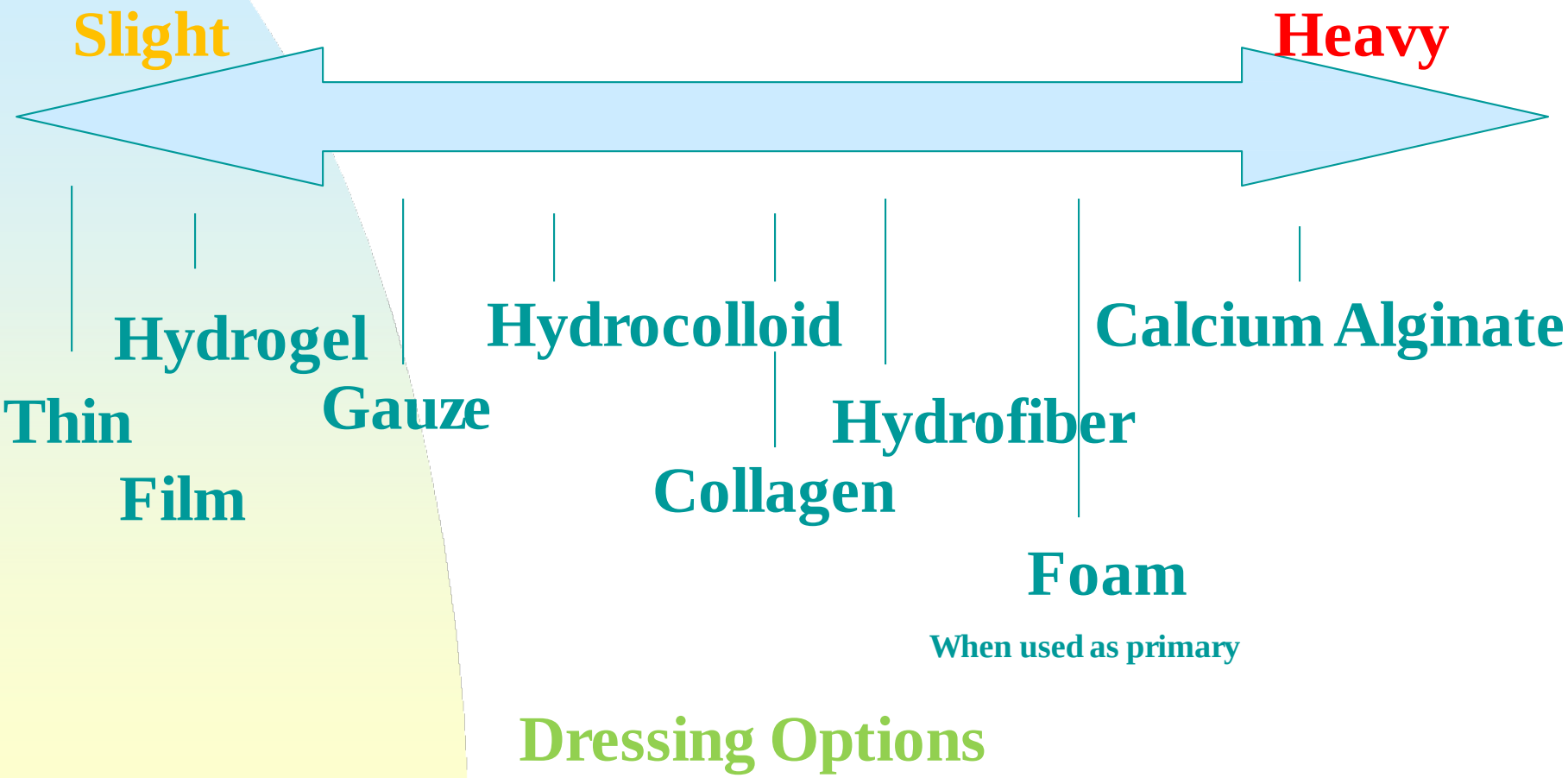
- Moist Wound healing
  - Location of wound
  - Extent (size/depth)
  - Amount and type of exudate
  - Tissue type on the wound
  - Compatibility with other therapies
  - Condition of periwound
  - Wound bioburden and risk for infection
  - Avoidance of pain and trauma with changes
  - Quality of life

Dressing Categories

- **Primary dressing**
  - The dressing that comes into contact with the wound bed
- **Secondary dressing**
  - The dressing used to cover and protect the primary dressing

- Absorptive
- Antimicrobials
- Biologicals & Biosynthetics
- Calcium Alginates
- Collagens
- Composite Dressings
- Contact layers
- Debridement
- Elastic Bandages
- Foams
- Gauze Dressings
- Honey Active Leptospermum)
- Hydrocolloids
- Hydrogels (Amorphous, Impregnated, sheets
- Iodine
- PHMB
- Silicone Sheets
- Silver Solutions
- Transparent Films
- Wound Fillers

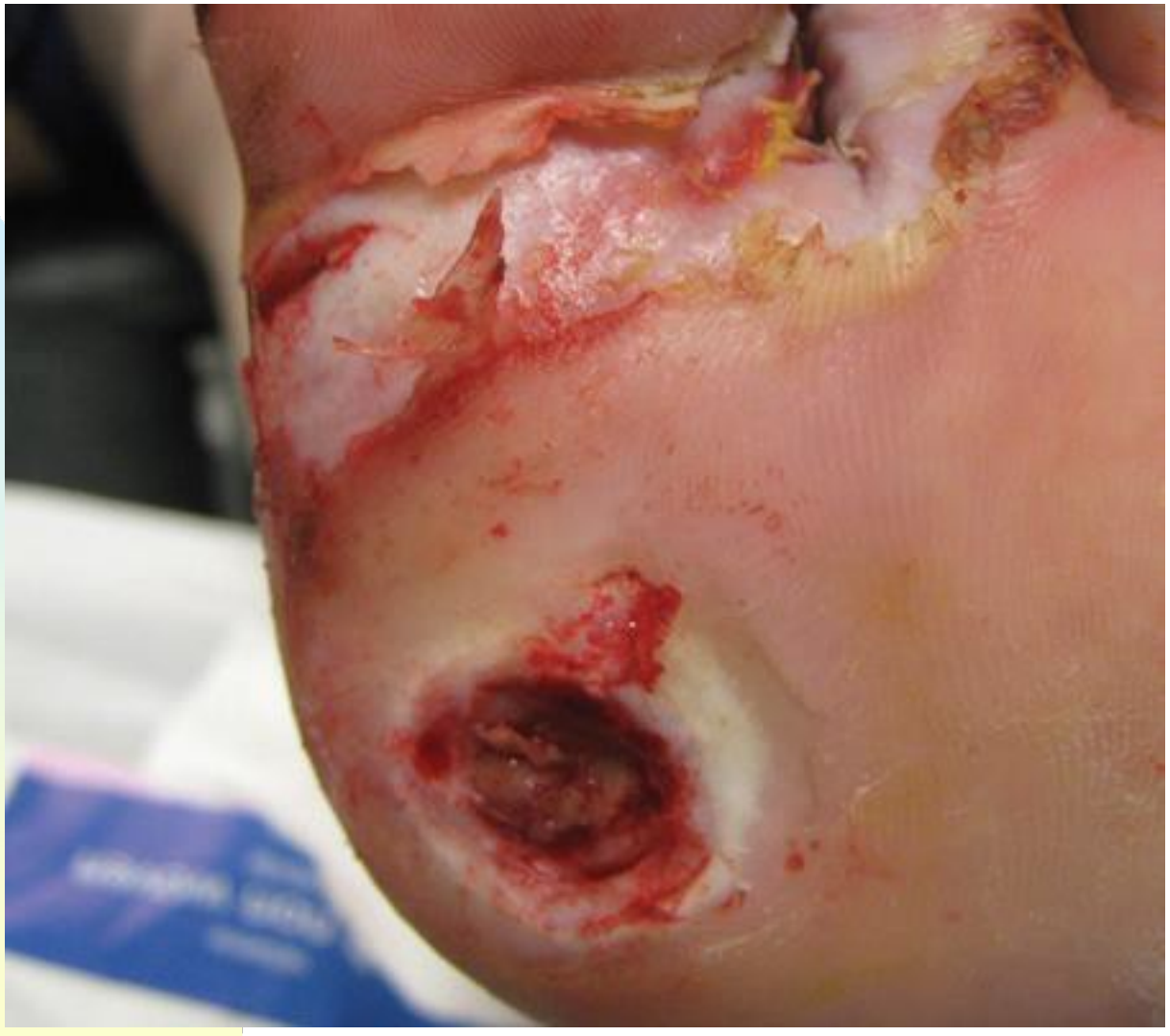
Amount of Drainage



Typical Features of DFU and Differentiation

Feature	Neuropathic	Ischaemic	Neuroischaemic
Sensation	Sensory loss	Painful	Degree of sensory loss
Callus/necrosis	Callus present and often thick	Necrosis common	Minimal callus Prone to necrosis
Wound bed	Pink and granulating, surrounded by callus	Pale and sloughy with poor granulation	Poor granulation
Foot temperature and pulses	Warm with bounding pulses	Cool with absent pulses	Cool with absent pulses
Other	Dry skin and fissuring	Delayed healing	High risk of infection
Typical location	Weight-bearing areas of the foot, such as metatarsal heads, the heel and over the dorsum of clawed toes	Tips of toes, nail edges and between the toes and lateral borders of the foot	Margins of the foot and toes
Prevalence (based on[35])	35%	15%	50%

Case Studies -Discussion



Neuropathic DFU

Ischemic DFU

Neuroischaemic DFU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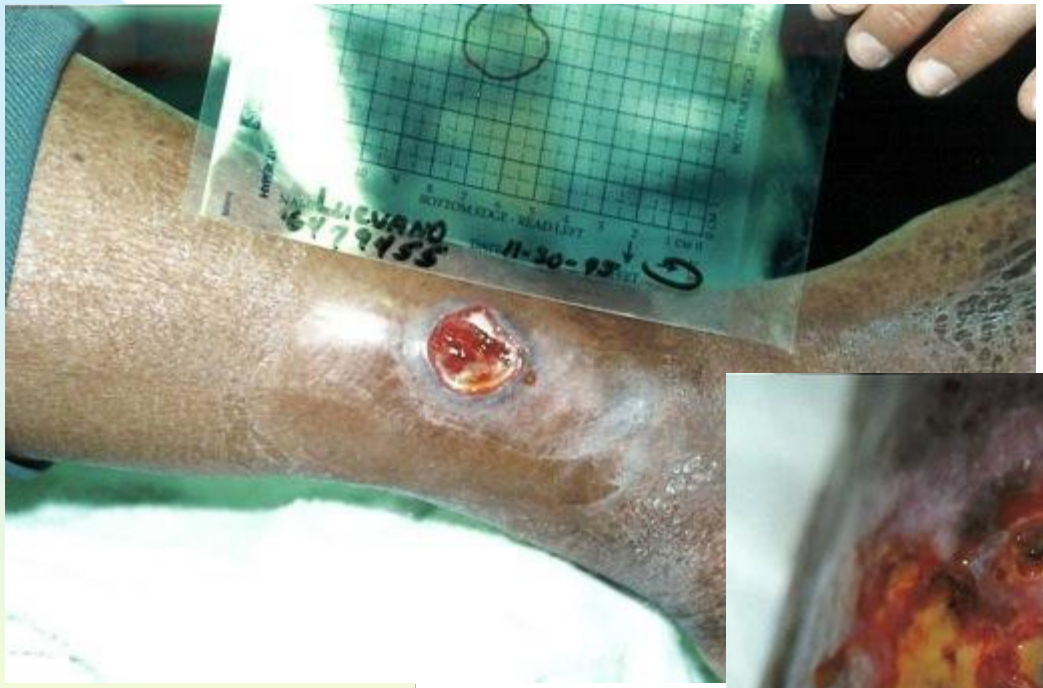
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PROPERTY
NOT FOR SALE

Prevention

Does the patient know their ABC's

- The ADA recommends blood glucose below 7 percent, with the normal range generally considered to be 4 to 6 percent.
- "B" represents normal blood pressure of 130/80 or lower.
- "C" involves keeping LDL cholesterol below 100 and HDL 40 or higher.
- Education
- Healthy balanced diet
- Regular physical activity
- Smoking cessation
- Sustained weight loss in the overweight

Treatment and Follow-up

Priority	Indications	Timeline	Suggested follow-up by specialist
Urgent (active pathology)	Open wound or ulcerative area, with or without signs of infection New neuropathic pain or pain at rest Signs of active Charcot neuroarthropathy (red, hot, swollen midfoot or ankle) Vascular compromise (sudden absence of DP/PT pulses or gangrene)	Immediate referral/consult	As determined by specialist
High (ADA risk category 3)	Presence of diabetes with a previous history of ulcer or lower extremity amputation Chronic venous insufficiency (skin color change, or temperature difference)	Immediate or "next available" outpatient referral	Every 1-2 months
Moderate (ADA risk category 2)	Peripheral artery disease +/- LOPS DP/PT pulses diminished or absent Presence of swelling or edema	Referral within 1-3 weeks (if not already receiving regular care)	Every 2-3 months
Low (ADA risk category 1)	LOPS +/- longstanding, nonchanging deformity Patient requires prescriptive or accommodative footwear	Referral within 1 month	Every 4-6 months
Very low (ADA risk category 0)	No LOPS or peripheral artery disease Patient seeks education regarding: foot care, athletic training,	Referral within 1-3 months	Annually at minimum

Twenty Steps Toward Foot Health in Diabetes

1. Inspect your feet daily for blisters, bleeding, or lesions between toes. Use a mirror to see the bottom of the foot and the heel.
2. Have a family or friend check your feet if you are unable to do so.
3. Have regular foot examinations by your diabetic foot care specialist. At least annually or more often
4. Always remove both shoes and stockings when visiting your doctor.
5. Always wear well-fitted stockings or socks with your shoes. Padded hosiery may reduce pressure and be more protective.
6. Inspect the soles and inside your shoes for foreign objects before putting them on.
7. Shoes should be properly measured, comfortable, and easy to put on at the time of purchase.
8. Wear leather shoes with adequate room for the toes. Running or athletic shoes are best for recreational walking.
9. Change shoes every four to six hours.
10. In cold weather, wear insulated boots or heavier socks. Be sure the shoes allow enough room to allow for heavier socks.
11. If you've lost sensation, do NOT walk barefooted in the house, outside, or at the beach.
12. Do NOT use hot water bottles or heating pads to warm your feet. Use warm socks instead.
13. Do NOT soak your feet.
14. Do NOT use acids or chemical corn removers.
15. Do NOT perform "bathroom surgery" on corns, calluses, or ingrown toenails.
16. Wash feet daily and be sure to dry well between the toes. Apply moisturizing cream liberally, but avoid between the toes.
17. Test the temperature of the bath water with your ELBOW or THERMOMETER. Do NOT let hot water drip onto your toes.
18. Call your foot care specialist immediately if you detect a new lesion or if your foot becomes swollen, red, or painful. Stay off your foot until you see your doctor.
19. Learn all you can about your diabetes and how it can affect your feet.
20. Maintain good diabetes control and do not smoke

SALSA 2014

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