Lower Extremity Ulcers and Amputation as Complications of Diabetes:

Role of the interdisciplinary wound team and wound centers:

HYPERBARIC WOUND AND EDEMA CENTER
FORT HEALTHCARE
LE ulcers and amputation as complication of diabetes: Medical aspects:

ROBERT GOLDMAN, MD, CWS-P; MEDICAL DIRECTOR

Epidemiology

- Amputation rate over past two decades is down.
- Number of people with diabetes have increased.
- Slight reduction in number of amputations
Lower incidence diabetes-related complications 1990 -> 2010

Trends in Rates of Diabetes-Related Complications from 1990 to 2010 among U.S. Adults with Diagnosed Diabetes

60% diabetic leg amputations 1990->2010
But prevalence of diabetes increasing: Little net decrease

And 5 year mortality after leg amputation still exceeds 50%
Cause of foot ulcers: Progressive sensory, motor and autonomic loss.

- Dying back neuropathy.
- Foot deformities.
- Pressure areas
- Foot ulcers. Disease process: Neuropathy.
Peripheral arterial disease

- Distal more than proximal.
- Small vessel disease.
- Nitric Oxide mediated.

Patterns of arterial insufficiency

- Proximal disease
  - HTN
  - Smoking
- Distal disease
  - Diabetes
  - End stage renal disease
Small vessel disease

- Immune problems
  - WBC decreased phagocytosis.
  - Decreased ability to fight infection.
Opportunities for early intervention, Primary Care

- Higher A1c associated with more severe complications, more quickly.
- Often associated with smoking.
- Other opportunities for improved adherence

Preventive care
Wagner Scale for Diabetic Foot Ulcers

- Wagner 1: Surface ulcer
- Wagner 2: Break fascial plane, no infection.
- Wagner 3: Break fascial plane, infection (cellulitis and/or osteomyelitis).
- Wagner 4: Gangrene
Wagner 3

Wagner 4
Treatment paradigms.

- Neuropathic disease—off loading
- PAD – revascularization.
- Mixed disease: both off loading and revascularization

Wagner I and II: Interdisciplinary care best practiced in comprehensive wound centers.

- Focus on local wound care
- Skin substitutes
- Treatment of infection.
- Off loading.
  - DH Walker
  - TCC
Optimizing Outcomes...
Wound Care Team

- Coordinated care gives best chance of success
- Good communication, in a patient-centered system ensures better outcomes at lower cost

Why refer to a WCC...

WCCs can provide easier access to advanced technology
WCCs can provide better accountability to patients, providers, and payers

Wagner III and IV: Limb preservation: heal or turn major amputation into minor one.

- Plan: wound care, rehab, surgical, infectious disease, vascular, hyperbaric
- Revascularization has become commonplace.
- Treatment of osteomyelitis.
- Podiatric or Orthopedic surgery at the foot level.
Team management: Within wound center.

- Wound physician, nursing, rehabilitation
- Surgical evaluation for debridement of bone or minor amputation.
  - Podiatric surgery
  - Ortho foot and ankle.
- Vascular specialist: Revascularization.
- Osteomyelitis; Infectious disease

Growth of Wound Care Centers & HBOT

- 2010:
  - 2500 centers nationwide
  - 600 partnership of wound management organization and hospitals
  - Remainder “free standing”
- Centers profitable
- Growth 7%-8% per year over past 20 years
Hospital Discharge rates for PAD and ulcers decreased in US1990-2010

Hyperbaric oxygen and limb preservation.

- Treatment of Wagner III and IV: This is a CMS approved indication:
- HBOT center for Diabetic foot ulcers: Closest is Fort Healthcare.
- Dane County: There is HBOT, but is not for CMS approved applications
U: Hyperbarics improves odds of saving limb.

**RESULTS**

- **Meta-analysis**

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<td>Orani</td>
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**Total (fixed effects)**

**Total (random effects)**

**CONCLUSIONS**

The meta-analysis revealed the odds of saving a limb in patients treated with hyperbarics are significantly higher compared to controls. The findings support the use of hyperbarics in limb salvage procedures.

**RESEARCH DESIGN AND METHODS**

The study was a systematic review and meta-analysis of randomized controlled trials (RCTs) comparing hyperbarics therapy to standard care in the treatment of diabetic foot ulcers. The primary outcome was limb salvage rate, defined as the percentage of patients with no evidence of amputation at the end of the follow-up period. The review included trials published in English that compared hyperbarics therapy to standard care in patients with diabetic foot ulcers. The primary outcome was limb salvage rate, defined as the percentage of patients with no evidence of amputation at the end of the follow-up period.
HBOT improves healing of DFU

- Randomized, double blinded, sham-controlled trial
- N=94 patients with Wagner 2, 3, 4 for >3 months; Most Wagner 3.
- Intent to treat
- At one year: 52% healed in HBOT group and 29% in sham control group.
- For >35 treatments: 61%/27%


Level “A” evidence: Improved diabetic healing with HBOT
Benefit is Limb preservation, Risks include:

- Pressure (Barotrauma)
  - Ear
  - Eye
  - Lung
- Oxygen toxicity
  - Heart
  - CNS
Conclusion

- Diabetes complications includes wound and limb loss. Rate improved 60% over last three decades.
- Diabetes leads to wounds and infection due to vascular, neuropathic, immune, pressure factors.
- Reduce incidence wounds: Better diabetic management, including foot exams, shoes.
- Reduce amputations: Wound centers.
  - Wagner I, II: Wound centers.
  - Wagner III, IV: Wound surgical revasc, ID, Hyperbarics
- Mortality in diabetes is high but does not have to include major limb loss

Identifying & Educating The Diabetic Patient

PENNY SULLIVAN RN, CWON
Identify People At Risk

- Loss of protective sensation.
- Lower extremity arterial disease.
- History of previous ulcers or amputation.
- Poor diabetes control, HgbA1c > 9.
- Greater than 10 yrs with diabetes.
- Smoking.
- Visual abnormalities.
- Elevated planter pressure, abnormal gait.
- Foot deformities
- Rigid foot deformity.

Education

- Wash feet daily with lukewarm water (<110°).
- Dry feet well especially between toes.
- Moisturize feet daily with fragrance and alcohol free lotion, do not apply between toes.
- Change socks daily.
- Always wear shoes, even in the house.
- Do not use heating pads, water bottles, or electric blankets.
Education

- Shoes with large toe box and adequate cushioning.
- Check feet daily for blisters, callus, wounds, cracks.
- Examine shoes before donning.
- Quit smoking and exercise.
- **REPORT ANY FOOT ABNORMALITIES**

Education

- Signs and Symptoms of Infection in Chronic Wound
  - Redness
  - Swelling
  - Increase drainage
  - Increase pain
  - Increase warmth
  - No decrease in wound size

*Chronic wound may only exhibit 1 of these signs when infected!!*
Alleviate Fears

❖ Explain to patient & family interventions the MD may perform.
  ▶ Debridement
    ▶ Topical lidocaine
    ▶ Pain medication 45-60 minutes before appointment

Because treating an DM wound takes a multidisciplinary team, it can be overwhelming.

Topical Treatments

❖ Dressing the wound
  ▶ Where to get dressings
    ▶ Insurance
    ▶ Finances
  ▶ Can the patient dress the wound
    ▶ Dexterity
    ▶ Support system
    ▶ Mental ability
    ▶ Home health support
Education

- Off loading of the wound
  - TCC
  - Creative dressing
  - Off loading boots
  - DH walker

Debunking Old Treatments

- My mother always said
  - Clean wounds with peroxide
  - Leave wounds open to air
  - Scabs are good, means the wound is healing
  - Soaking with Epson salt
A Day in The Life of an HBO Patient

TRICIA ABENDROTH, CHT

Initial encounter

- Overview on approved and Unapproved materials in the chamber
- Address Patient concerns
Treatment Day

- What to expect
- Barotrauma prevention
- Blood sugars & insulin dependent patients

Treatment specifications

- Depth & number of treatments
- Air breaks and Oxygen Toxicity
- In Chamber TCOM
The personal touch

- Warm and inviting environment
- Getting to know the patients
- Working as a family in wound care