Comprehensive Medical Care of the Diabetic Foot

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Disclosures

• None relevant to this presentation
Burgeoning Crisis of Diabetes

- 422 million: global prevalence of diabetes 2014 (8.5% population)
- 642 million: predicted prevalence by 2040
- Increasing numbers are due to
  - Population growth
  - Aging
  - Urbanization
  - Increasing obesity
  - Decreasing physical activity
- The urban population in developing nations will double between 2000 and 2030

Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4·4 million participants

More obese than underweight 2014

- More obese men and women now live in China and the USA than in any other country
- US has 41.7 million obese men and 46.1 million obese women
- Global obesity rates among men went up from 3.2% in 1975 to 10.8%, while among women they rose from 6.4 % in 1975 to 14.9%.

NCD Risk Factor Collaboration (NCD-RisC) The Lancet Volume 387, Issue 10026, Pages 1377-1396 (April 2016)
“an additional Supercenter per 100,000 residents increases average BMI by 0.24 units and the obesity rate by 2.3 percentage points.”

Courtemanche, Charles and Carden, Art, Supersizing Supercenters? The Impact of Wal-Mart Supercenters on Body Mass Index and Obesity (September 10, 2010)
Younger presentation moves up all the complications
Seconds Count

• Every 7 seconds someone dies from diabetes
• Every 17 seconds someone is diagnosed with diabetes
• 1 million lower extremity amputations globally per year

One amputation every 20 seconds worldwide due to Diabetes
Diabetes Belt identified

Trust for America’s Health and the Robert Wood Johnson Foundation
Diabetes…
Chronic Illness or Malignant Disease?

- DM and its complications are the sixth leading cause of death in the US
- 50% of people who die from diabetes are under age of 60
- The diagnosis of DM is generally addressed as a chronic illness treated by lifestyle changes and medical care
- The diagnosis is rarely addressed as potentially fatal
- Diabetic foot ulcers are rarely seen as increasing mortality, although 5 year mortality rates for new onset DFU, amputation or both are reported as high as 74%

Usual response
Changing the Paradigm

Reported 5-year mortality rates

Which deserves more aggressive care?

Neuropathic ulcer
5 yr mortality 45%

Breast Cancer
5 yr mortality 18%
Ischemic Ulcer
5 yr mortality 55%

Colon cancer
5 yr mortality 48%
Diabetic Foot Ulcers

• Clinicians need to have a heightened awareness of the implications of DFU’s
  • ..overall high mortality in all the ulcer sub-types suggests that diabetic foot ulcers may serve as a marker of as-yet-unknown conditions increasing mortality..¹
  • ..upon onset of diabetic ulcer, a cardiovascular assessment would be advisable…²
  • Prevention and identification…remove patients shoes and socks and examine their feet
  • Overall, the risk for death among people with diabetes is about twice that of people of similar age but without diabetes.

The Problem

• After an extensive literature review it has been estimated that 30-40% of the patients with DFU are not being treated according to the standard of care and 20-30% are mistreated or treated with substandard treatments.

• In light of this, a multidisciplinary team of practitioners met to develop a straight forward and practical approach to these complicated cases in order to improve outcomes.
What is the “standard” to prevent ulcers?

• Address the medical issues: glycemic control, annual foot exam
• Address the vascular issues: vascular screening
• Address the pressure issues: offloading
• Address the activities of daily living: self exams, protective foot wear
• STOP SMOKING
Glycemic Control

• Around a HgA₁C of 6-7
• Can try and get patient to visualize the red blood cell coated in sugar, various online learning tools
Liken the highly glycemic RBC to....

Hard, inflexible, and unable to get through the capillary bed
Percent of diabetic Medicare beneficiaries receiving hemoglobin A1c testing (2010)

Checking for loss of protective sensation…60 second Tool Screening for the High Risk Diabetic Foot

Prof Gary Sibbald, https://www.youtube.com/watch?v=4OBPHj3vhI
Semmes-Weinstein monofilament 5.07 (LOPS = 1 site new ADA)

Fig. 2 Demonstration of the assessment of peripheral neuropathy using the Semmes-Weinstein monofilament: (A) depicts application of the monofilament, (B) demonstrates the bend in the filament when assessing for neuropathy.

Vascular Evaluation..

- Despite normal results to some or all the tests previously discussed, if there is a high suspicion for PAD, further evaluation is needed.
- Vascular surgeon should be consulted for angiography and intervention if possible.
- In an observational study of 104 patients with normal pulses, ABI’s and TCPO2, that were eventually evaluated with arteriography, 99% of them had hemodynamically significant lesions in the presence of ulcers.
Percent of Americans ≥40 years old with lower extremity disease (i.e. peripheral artery disease, peripheral neuropathy, foot ulcers, or lower extremity amputation). Lower extremity disease is almost twice as common in people with diabetes as in those without diabetes. Source: CDC, 2005.
SPP and Percutaneous Peripheral Intervention

- Patency does not always equate to perfusion
  - Circulation on the micro-level is frequently overlooked in favor of arterial patency assessment
  - Poor microcirculation equates to poor outcomes
    - Repeat procedures and/or subsequent amputation
Thermal imaging (heat-sensitive photography) shows that this diabetic’s left foot is much cooler (the black regions) than the rest of his body, due to decreased peripheral circulation. (The patient is sitting and facing us.) Source: NASA, 2009.
Geographic variation of major amputation of the lower extremity
54% of patients had no vascular procedures performed in the year prior to amputation, 2003–2006

What your feet can tell you about your health...what do you look for?

- Gross inspection
  - Corns, callouses, deformities
  - Dry scaly skin
  - Thickened yellow toenails
  - Absence of hair
  - Missing parts
But if they don’t have a wound (yet), prevention is the key...but nothing matters if you don’t look at the feet
Cornerstones of foot management

There are five key elements that underpin foot management:
1. Regular inspection and examination of the at-risk foot
2. Identification of the at-risk foot (loss of protective function key)
3. Education of patient, family, and healthcare providers
4. Appropriate footwear
5. Treatment of non ulcerative pathology
Education: Items that should be covered when instructing the high-risk patient are as follows

- Daily feet inspection, including areas between the toes
- The need for another person with skills to inspect feet, should the people with diabetes be unable to do so. (If vision is impaired, people with diabetes should not attempt their own foot care.)
- Regular washing of feet with careful drying, especially between the toes
- Water temperature, which should always be below 37 °C
- Not using a heater or a hot-water bottle to warm one’s feet
- Avoidance of barefoot walking indoors or outdoors and of wearing of shoes without socks
- Chemical agents or plasters to remove corns and calluses, which should not be used
- Daily inspection and palpation of the inside of the shoes
- Not wearing tight shoes or shoes with rough edges and uneven seams
- Use of lubricating oils or creams for dry skin, but not between the toes
- Daily change of socks
- Wearing of stocking with seams inside out or preferably without any seams
- Never wearing tight or knee-high socks.
- Cutting nails straight across (Figure 3)
- Corns and calluses, which should be cut by a healthcare provider
- Patient awareness of the need to ensure that feet are examined regularly by a healthcare provider
- Notifying the healthcare provider at once if a blister, cut, scratch, or sore has developed
Guess what?

- 90% of patients were found to do
  - Adequate moisturizing
  - Proper washing and drying
  - Proper toe nail cutting, no cuticle trimming
  - Routine shoe inspection
  - No pumice stone use
  - No barefoot walking

- Only 10% wore appropriate footwear!!!
If the shoe fits…wear it!

In a survey of diabetics

- 34.9% wore ill-fitting shoes
  - At least one size too large or small
- 11.9% had a discrepancy of at least 1.5 shoe sizes
- 90% of patients did not know their shoe width
- Right and left shoe sizes are different in 60% of patients

Key interventions

• Diabetics:
  • Never barefoot even at home
  • Shoes with extra depth
  • Buy shoes later in day
  • Seamless socks
  • Have two pairs to change out
Smoking and Diabetes

- Smoking leads to insulin resistance
- Increased risk of developing diabetes
- Those who smoke > 15 cigarettes per day have a 61% higher risk of getting diabetes than those who smoke less than 15 per day
- Smoking inhibits the immune system, coupled with diabetes, make infections more likely
  - Current smokers 2 x as likely to develop infection
The Ulcer Presents: Pathophysiology

- Common pathway for ulceration
  - 50% of diabetics have NEUROPATHY
  - Insensate
    - Minor trauma
  - Deformed foot
  - Abnormal gait
  - Callous formation
    - Subcutaneous hemorrhage

- Concomitant vascular disease complicates the healing
  - Macrovascular
  - Microvascular
50% in 4 weeks

- If the diabetic wound (and perhaps any wound) is not 50% better in 4 weeks of good conventional care
  - H&P
  - Neurological exam
  - Vascular evaluation
  - Foot and Ulcer evaluation
  - Offloading
  - Infection control
  - Debridement
Offloading-height matters

Figure 2. The knee-high, ankle-high, and shoe-high RCWs and a standard athletic shoe and the resultant walking peak plantar pressures on the right foot of the same patient in 3D graphs (the heel is presented at the top of the 3D graphs and the toes at the bottom).

http://lermagazine.com/article/rethinking-device-design-to-improve-compliance
• Neuropathic ulcers are one of the most common complications of diabetes.

• Aggressive and effective wound care is the goal for these patients.

• Standard management for these patients is revascularization if possible, preparation of the wound bed, infection control and offloading.

• Smoking cessation

• If wound care is failing after 4 weeks advance modalities like bioengineered skin substitutes, VAC and HBO among others should be started.
THANK YOU FOR YOUR ATTENTION
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