Treatment of the diabetic foot – the how and why

Gianmarco de Donato
Assistant Professor
Vascular and Endovascular Surgery
University of Siena - Italy
Disclosure

Speaker name:

...Gianmarco de Donato.................

I have the following potential conflicts of interest to report:

- Consulting
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)

X I do not have any potential conflict of interest
Three pathological components that lead to diabetic foot complications:
- Ischaemia,
- Neuropathy,
- Infection

They frequently occur together as an aetiologic triad.
Neuroischaemic ulcers

- The role of peripheral arterial disease (PAD) in diabetic foot underestimated
- Symptoms are less frequent
- Lack of protective sensation, the foot is “vulnerable” to minor injuries (excess pressure, mechanical or thermal injury)
Neuroischaemic ulcers

Ulcer as first sign of PAD
Osteoarthropathy

- Motor neuropathy
- Foot deformities
- Limited joint mobility
- Altered loading of the foot
The most important treatment of any ulcer with neuropathy is to restrict weight bearing.
Neuropathy and ischemia are the initiating factors, with different weight in different patients, and infection is mostly the consequence.
Diabetic foot

Where has the vascular community been in the last decades regarding this particular topic?
Vascular Surgery
Interest in PAD

1990s
Vascular Surgery
Interest in PAD

2000s

Forces Exerted in SFA

1. Extension / Contraction
2. Torsion
3. Compression
4. Flexion
Vascular Surgery
Interest in PAD

2005-2010
Vascular Surgery
Interest in PAD

2007
Global Projections for the Diabetes Epidemic: 2003-2025

World
2003 = 194 M
2025 = 333 M
↑72%

NA
23.0 M
36.2 M
↑57.0%

EUR
48.4 M
58.6 M
↑21%

EMME
19.2 M
39.4 M
↑105%

SEA
39.3 M
81.6 M
↑108%

SACA
14.2 M
26.2 M
↑85%

AFR
7.1 M
15.0 M
↑111%

WP
13.0 M
75.8 M
↑79%

M = million, AFR = Africa, NA = North America, EUR = Europe, SACA = South and Central America, EMME = Eastern Mediterranean and Middle East, SEA = South-East Asia, WP = Western Pacific.
**Diabetic angiopathy**

- PAD, macroangiopathy typically affecting infrapopliteal arteries

- Microvascular dysfunction
  - presence of arterio-venous shunting
  - pre-capillary sphincter malfunction
  - capillary leakage
  - venous pooling
  - hormonal activity in the vessel
  - inflammation in its wall
Old conception

Diabetic foot is the result of untreatable occlusive arteriolar disease

Any effort for limb salvage in DM pts is a waste of time
Diabetic foot ulcers
Cross-disciplinary collaboration

- Primary care
- Diabetologist
- Podiatrist
- Interventionalist (Vascular surgeon/Radiologist)

Early diagnosis of diabetic vascular disease:

Early revascularization & Wound care / Limited amputation

rehabilitation
**Recommendation:** Ischemia should not be excluded as a cause of diabetic foot ulcer unless proven absent.

Use of rigid noninvasive methods not good enough

- bias due to medial sclerosis, tissue lesions

**Recommendation:** Trust ABI when low but not when high. An ABI <0.6 indicates significant ischemia in respect to wound healing potential whereas on ABI >0.6 has little predictive value and therefore at least the toe pressure should be measured.
**Clinical examination**

*Recommendation*: Every foot ulcer should be examined for the presence of ischemia.

*Recommendation*: Every foot ulcer should be examined for the presence of neuropathy.

*Recommendation*: Every diabetic foot ulcer should be examined for the presence of infection.

Management of infection

Antibiotic therapy

- necessary for virtually all infected wounds
- not beneficial for noninfected ulcers
- insufficient without appropriate wound care
- Patients with uncontrolled or limb-threatening infections require immediate hospitalization, immobilization and intravenous antibiotics

Timing of treatment of infection vs. revascularisation

**Recommendation**: The severity of infection guides the decision whether to debride first or to revascularize first
Debridement

Surgical, enzymatic, biological or autolytic methods

**Recommendation:** No single method is outstanding in terms of enhancing diabetic ulcer healing.

**Recommendation:** Hyperbaric oxygen therapy may be indicated for a selected group of diabetic ulcers but it is not clear which patients are likely to benefit and what is the optimal duration.

**Recommendation:** Negative pressure wound therapy appears to be as effective and under certain circumstances more effective than other available local wound treatments in patients without significant infection.
New 4-step protocol:

1. Early diagnosis with a 24 h on call DF team;
2. Urgent treatment of severe foot infection with an aggressive surgical debridement;
3. Early revascularization within 24 hours;

Time is:
- Heart
- Brain
- Tissue

Endovascular strategy

PRIMARY GOAL OF ANY TREATMENT

• Restoring straight-line flow into foot especially to the region of the non-healing ulcer
Endovascular strategy
Tibial vessels

0, \(1/2\)

1
Endovascular strategy

Tibial vessels
Endovascular strategy
Tibial vessels
Diabetic foot treatment

RESTORING FLOW + WOUND CARE
Diabetic foot treatment

RESTORING FLOW + WOUND CARE (enzimatic, autolytic)
Endovascular strategy & wound care

It's not enough that we do our best; sometimes we have to do what's required.

(Winston Churchill)
Diabetic foot treatment

RESTORING FLOW + WOUND CARE / MINOR AMPUTATION
Diabetic foot treatment

RESTORING FLOW  +  WOUND CARE / MINOR AMPUTATION
Diabetic foot treatment

RESTORING FLOW + WOUND CARE / MINOR AMPUTATION
Diabetic foot treatment

RESTORING FLOW + WOUND CARE / MINOR AMPUTATION
Diabetic foot treatment

Retention of plantar load-bearing tissues, which are uniquely capable of tolerating the forces involved in weightbearing.
The mainstays of successful diabetic foot surgery include:

- radical debridement and lavage of all devitalized tissue with preservation of viable structures
- insurance of adequate blood supply,
- use of tissue transfers when necessary,
- negative pressure wound therapy (in patients without significant infection),
- and antibiosis through the use of topical, oral, and parenteral antibiotics.
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Diabetic foot treatment

Time is tissue

Early revascularization

Aggressive surgical debridement/wound care
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