Chronic limb ischemia: preventing amputations – an interdisciplinary challenge

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Disclosure

Speaker name: Rolf P. ENGELBERGER.
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)

I do not have any potential conflict of interest
Definition: TASC II

**Recommendation 16**
Clinical definition of critical limb ischemia (CLI)

- The term critical limb ischemia should be used for all patients with chronic ischemic rest pain, ulcers or gangrene attributable to objectively proven arterial occlusive disease. The term CLI implies chronicity and is to be distinguished from acute limb ischemia [C].

- **Ischemic pain:** ankle pressure < 50mmHg or toe pressure < 30mmHg

- **Ulcer:** ankle pressure < mmHg or toe pressure < 50mmHg

Norgren et al, TASC II, JVS 2007
Critical limb ischemia: background

- 500 to 1000 new patients / year / 1 million inhabitants (TASC II).
- Up to 740.000 in Europe, 313.000 in USA, 3.800.00 in Asia.
- Elderly and frail patients.
- Frequently associated with cardio- and cerebrovascular co-morbidities.
- Poor collateralisation.
- > 40 % are diabetics.
Fig. A3. Fate of the claudicant over 5 years (adapted from ACC/AHA guidelines). PAD – peripheral arterial disease; CLI – critical limb ischemia; CV – cardiovascular; MI – myocardial infarction. Adapted with permission from Hirsch AT et al. J Am Coll Cardiol 2006;47:1239-1312.
**Fig. A8.** Survival of patients with peripheral arterial disease. IC – intermittent claudication; CLI – critical limb ischemia.
Fate of patients with amputation

Abola et al, REACH, Atherosclerosis 2012
Diabetic foot syndrome – multifactorial pathogenesis

Multidisciplinary treatment!
Folgen der Polyneuropathie
Hammerzehen

Gleichgewicht zwischen M. tibialis anterior und kleinen Fußmuskeln verschoben

Subluxation

Überlastung

Ulcera
Diffuse lesion pattern in CLI
Fig. A7. Typical overlap in vascular disease affecting different territories. Based on REACH data. PAD – peripheral arterial disease.
History of the team approach to amputation prevention: Pioneers and milestones

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Background: This historical perspective highlights some of the pioneers, milestones, teams, and system changes that have had a major impact on the management of the diabetic foot during the past 100 years. In 1934, American diabetologist Elliott P. Joslin noted that mortality from diabetic coma had fallen from 60% to 5% after the introduction of insulin, yet deaths from diabetic gangrene of the lower extremity had risen significantly. He believed that diabetic gangrene was preventable. His remedy was a team approach that included foot care, diet, exercise, prompt treatment of foot infections, and specialized surgical care.

Results: The history of a team approach to management of the diabetic foot chronicles the rise of a new health profession, Podiatric Medicine and Surgery, as well as the emergence of the specialty of Vascular Surgery. The partnership between the diabetologist, vascular surgeon, and podiatrist is a natural one. The complementary skills and knowledge of each can improve limb salvage and functional outcomes. Comprehensive multidisciplinary foot care programs have been shown to increase quality of care and reduce amputation rates by 36% to 86%. The development of distal revascularization techniques to restore pulsatile blood flow to the foot has also been a major advancement.

Conclusion: Diabetic foot patients are among the most complex and vulnerable of all patient populations. Specialized diabetic foot clinics of the 21st century should be multidisciplinary and equipped to coordinate diagnosis, off-loading, and preventive care; perform revascularization procedures; aggressively treat infections; and manage medical comorbidities. (J Vasc Surg 2010;52:3S-16S.)
What is multidisciplinary care?

- GP, nephrologist, diabetologist... → early recognition
- **Vascular specialist/Angiologist**
  - initial assessment, treatment plan/coordination, treatment, follow up
- Treat risk factors aggressively
  - Smoking cessation
- Conservative orthopaedic measurements (shoes)
- Revascularisation → interventional +/- vascular surgery
- Orthopedic surgeon → amputation, corrections
- Infectious disease specialist
- Nutrition specialist
Vascular specialist/Angiologist
Adherence to Guideline-Recommended Therapy Is Associated With Decreased Major Adverse Cardiovascular Events and Major Adverse Limb Events Among Patients With Peripheral Arterial Disease

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ACCF/AHA Guidelines 2011:
1. Platelet inhibitor
2. Statin medication
3. ACE inhibitor or ARB
4. Smoking abstinence

Rooke et al, Circulation 2011
Armstrong et al, J Am Heart Assoc 2014
Armstrong et al, J Am Heart Assoc 2014
Multidisciplinary care improves amputation-free survival in patients with chronic critical limb ischemia

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Background: This study was conducted to quantify the effect of multidisciplinary care (MDC) on amputation-free survival (AFS) and wound healing within a chronic critical limb ischemia (CLI) population.

Methods: We performed a retrospective, single-center cohort study of consecutive CLI patients presenting to the Vascular Surgery Service. Patients who received initial and follow-up wound care from the MDC were compared with patients who received standard wound care (SWC). The MDC team consisted of vascular, plastic, and podiatric surgeons who jointly managed wound care and directed any other consults or services as deemed necessary. SWC consisted of an inconsistent mix of providers without a defined manager, including nurses, wound care midlevel providers, general surgeons, internists, or the patients themselves. The referring physician determined the allocation of patients. The primary outcome variable was AFS, with a secondary evaluation of wound healing. The effects of baseline demographics, comorbid medical conditions, laboratory values, ischemic lesion severity and location, Rutherford classification, and participation in MDC were assessed. Significant univariate predictors ($P < .10$) of AFS were entered into a multivariate Cox regression model and assessed at an $\alpha = .05$.

Results: Between August 2010 and June 2012, 146 CLI patients (91 male [63%]) were evaluated by the Vascular Surgery Service and were followed up for a median of 539 days (interquartile range 314-679 days). Ischemic tissue loss was present in 85 patients (38 at Rutherford category 5, and 47 at Rutherford category 6). Within this cohort, 51 (60%) had MDC, and 44 (40%) had SWC. Fifty-eight patients (68%) underwent revascularization (open in 17, endovascular in 35, and hybrid in 6), 14 (8%) were managed with primary major amputation, and 13 (15%) declined revascularization. AFS was superior for patients in the MDC arm vs the SWC arm (593.3 ± 53.5 days vs 281.0 ± 38.2 days; log-rank, $P = .02$). Wound-healing times favored the MDC arm over the SWC arm (444.5 ± 33.2 days vs 625.2 ± 126.5 days), although this was not statistically significant (log-rank, $P = .74$). Multivariate modelling revealed that independent predictors of major amputation or death, or both, were nonrevascularized patients (hazard ratio [HR], 3.76; 95% confidence interval [CI], 1.78-8.02; $\chi^2$, $P < .01$), treatment by SWC (HR, 2.664; 95% CI, 1.23-5.77; $\chi^2$, $P = .012$), and baseline nonambulatory status (HR, 1.89; 95% CI, 1.17-2.85; $\chi^2$, $P < .01$).

Conclusions: MDC pathways for the management of a population of CLI patients improved AFS by greater than twofold and should be the standard of care for the CLI population. Baseline nonambulatory status and unrevascularized patients also predict worse AFS. Wound healing remains prolonged regardless of preoperative or postoperative wound care. Future study is required to evaluate the costs and functional outcomes for MDC in the management of CLI. (J Vasc Surg 2015;61:162-9.)
Amputation-Free Survival: Multi-disciplinary care versus Standard wound care

- Proportion of Survivors without Major Amputation

- P = 0.02, Log-rank

- Multi-disciplinary care

- Standard care

Chung et al, JVS 2015
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