Multidisciplinary approach to BTK

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Response to the increased demand of hospital care

Population is aging – Diabetes - Renal insufficiency

During the preceding decade the number of individuals with PAD, increased by 28·7% in LMIC and 13·1% in HIC.

Fowkes, Lancet, 2013
CLI: a high risk population

Age - Diabetes - Renal insufficiency

High morbidity outcomes after open revascularization

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Baumgartner, Eur J Vasc Endovasc Surg, 2006
Wasmuth, Eur J Vasc Endovasc Surg, 2009

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Norgren, Eur J Vasc Endovasc Surg, 2007
Diabetic foot

– Foot ulcer:
  • 25% of patients with diabetes
  • Precede more than 8 in 10 non-traumatic amputations

– Pathophysiologic mechanisms:
  Neuropathy, infection, ischemia, abnormal foot structure, biomechanics

– Complex clinical problem => requiring a multidisciplinary approach

Sumpio, J Vasc, Surg, 2010
Significant deficit in the adherence to published guidelines for atherosclerosis risk-factor management

- Less than one-third of patients with CLI present with their risk factors optimally managed
- Patients who are medically undertreated have an eight-fold risk of major amputation and/or death

The magnitude of the effect suggests that future trials and quality assessments should stratify outcomes by the quality of baseline medical management

Hogh, Eur J Vasc Endovasc Surg, 2012 - Chung, J vasc, 2013
Suboptimal outcomes after revascularization

Despite novel techniques and therapies devices:

- 25% of patients fail to survive with an intact limb at 1 year (Conte, J Vasc Surg, 2009)

**There is room for improvement to improve:**

- **Survival**
- **Amputation free survival**
- **Patency**
- **Wound healing**

- Primary patency about 34% and amputation free survival up to 75% (Conrad, J Vasc Surg, 2011)

- Wound-healing outcomes vary widely in the literature, with complete wound healing achieved in 40% to 50% of patients between 6 and 10 months (Chung, J Vasc Surg, 2006; Fernandez, J Vasc Surg, 2010)
Failed trials

IN.PACT Amphirion vs. PTA in patients with CLI and infrapopliteal revascularization

Drug-Eluting Balloon Versus Standard Balloon Angioplasty for Infrapopliteal Arterial Revascularization in Critical Limb Ischemia
12-Month Results From the IN.PACT DEEP Randomized Trial

Thomas Zeller, MD,* Iris Baumgartner, MD,† Dirk Scheinert, MD,‡ Marianne Brodmann, MD,§ Marc Bosiers, MD,¶ Antonio Micard, MD,‖ Patrick Peeters, MD,|| Frank Vermassen, MD, PaD,∗∗ Mario Landini, MS,++ David B. Sneed, PhD,+++ K. Craig Kent, MD,++++ Krishna I. Rocha-Singh, MD,++++ IN.PACT DEEP Trial Investigators

Failure Hypothesis?
- Selection of patients: what are the best candidates?
- Lack of medical FU?

Multi-center Randomized Trial
- 358 patients
- R3 to 6
- Avg lesion length ~100 to 120-mm
- Iy endpoints: LLL and TLR

IMPACT DEEP 12-month Results:
LLL: NS / TLR: NS

Freedom from Amputation:
- Standard PTA
- IN.PACT DEEP

Time After Initial Procedure (Days)
In CLI patients:
- comorbidity is higher
- medical treatment is still suboptimal
- Outcomes of open and endovascular repair should be optimized by medical follow up (drugs, wound care...)

=> CLI patients requires a MultiDisciplinary Care (MDC)
MultiDisciplinary Care (MDC)

• Vital core:
  – Vascular interventionalists (surgeons, cardiologists, radiologists...)
  – Podiatric surgeon

• More extensive team:
  – Plastic, orthopedic, and general surgery
  – Cardiology, diabetes and infectious specialists

Unfortunately, comparative-effectiveness research to date is insufficient to define the optimal multidisciplinary team.

Vascular interventionalists

• To improve blood flow – wound care – wound healing – limb salvage

• Revascularization remains the single most significant factor independently predicting major amputation or death, or both, in CLI by greater than a factor of three.

Podiatric surgeons

- They use techniques that are outside of the scope of most general and vascular surgeons, which may also contribute to improved outcomes.

- Off-loading strategies such as total contact casting and removable walkers, which resulted in significant accelerations in healing times.

Effect of Achilles Tendon Lengthening on Neuropathic Plantar Ulcers*
A Randomized Clinical Trial
Michael J. Mueller, PT, PhD; David R Sinacore, PT, PhD; Mary Kent Hastings, MS/PTATC; Michael J. Strube, PhD; Jeffrey E Johnson, MD


**Conclusions:** All ulcers healed in the Achilles tendon lengthening group, and the risk for ulcer recurrence was 75% less at seven months and 52% less at two years than that in the total-contact cast group. Achilles tendon lengthening should be considered an effective strategy to reduce recurrence of neuropathic ulceration of the plantar aspect of the forefoot in patients with diabetes mellitus and limited ankle dorsiflexion (≤5°).
Multidisciplinary care improves amputation-free survival in patients with chronic critical limb ischemia.


- Retrospective single-center cohort of consecutive CLI patients
- Independent predictors of major amputation or death, or both:
  - No revascularization
  - Initial nonambulatory status

- SWC: inconsistent mix of providers without a defined manager
- MDC: vascular, plastic, and podiatric surgeons who jointly managed wound care and directed any other consults or services as deemed necessary.
- The referring physician determined the allocation of patients.

- 146 CLI patients
- Median FU: 539 d
- Ischemic tissue loss: 58% (R5, R6)
- SWC: 40% - MDC: 60%
- 68% underwent a revascularization
Implementation of the MDC to manage diabetic foot ulcers within a given region or health care system has been reported to reduce long-term amputation rates from 82% to 62%.

The MDC approach gradually leads to improved screening and prevention programs and earlier interventions, and thus seems to reduce long-term costs.
Patient with diabetes and CLI
1 meeting a week

- Podiatric surgeon
- Vascular surgeon
  - Diabetologist
  - Vascular physician
- Infectious disease specialist
  - Nurse
To identify the disorders
CLI, hyperglycemia, local infection, neuropathic foot...

To define treatment strategy
Medical treatment - Revascularisation - Debridement – Off loading – Dressings - Negative-pressure wound therapy...
Cardiovascular risk factors:
- active smoking (100 packs/year)
- diabetes mellitus type 2

Medical history: coronary artery disease

Refer for a non healing ulceration of the right foot since 1 month

- ABI: 0.8
- Duplex scan: no significant stenoses of the femoropliteal segment
- TcPO2: normal
- X-Ray: osteomyelitis
Management

Neuropathic ulceration

Medical treatment:
optimization of diabetes treatment
Antiplatelet treatment

Revascularisation: /

Debridement: ambulatory hospitalization for minor amputation and tissue harvesting to figure out the antibiotherapy

Off loading: shoes
M. Duj. 72 years-old

Cardiovascular risk factors:
- diabetes mellitus type 2
- Hypercholesterolemia

Medical history: psoriasis

Refer for a fever and non healing ulceration of the right foot since 2 weeks

- ABI: 0.9
- Duplex scan: no significant stenoses of the femoropliteal segment
- TcPO2: non contributive
- X-Ray: osteomyelitis
Management

Neuropathic ulceration and septicemia

Hospitalization

Debridement: minor amputation and tissue harvesting to figure out the antibiotherapy

Medical treatment:
optimization of diabetes treatment
Antiplatelet treatment

Revascularisation: should be discussed in case of delayed wound healing

Off loading: shoes
Mr. PET. 69 years-old

Cardiovascular risk factors:
- Active smoking (60 packs/year)
- Diabetes mellitus type 2
- Hypercholesterolemia

Refer for rest pain and non healing ulceration of both limbs since 1 month

Medical history:
- Coronary artery disease
- Claudication (left limb)

ABI: 0.5/0.5
Duplex scan:
femoropopliteal thromboses
TcPO2: /
X-Ray: normal
Management

Ischemic ulceration (R5)

Hospitalization

Revascularization

Dressing

Medical treatment:
- optimization of diabetes treatment
- antiplatelet treatment – statins
- antibiotherapy after harvesting
CLI Revascularisation

Endovascular as a first line of treatment

Arteriography
antegrade
operating room
diagnosis
treatment
Take home messages

• MDC improves access to care, because multiple team members can see the patients.

• MDC improves the potentially to intervene before the development of irrevocable necrosis in the foot.

• MDC improves operative selection: room for improvement

• MDC improves the ability to survey and post-amputation wound care
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