QualiCCare

Interprofessional care quality for people with chronic and multiple diseases

Version 2023

Peripheral arterial disease (PAD)

Key issues and actions in initial management of acute diabetic foot syndrome and foot ulcer (DFS/DFU)

Important facts

→ **Up to 50 % of patients with DFS have Peripheral Arterial Disease (PAD).*** [1]

→ **PAD is a leading risk factor for adverse limb events in diabetics.** [2]

→ **Palpation of foot pulses are examiner-dependent, therefore if wound size reduction is not > 50% in 4 weeks despite the presence of palpable foot pulses, clinical examination should be completed by Ankle-Brachial-Index (ABI), Toe-Brachial-Index (TBI), and audible handheld Doppler ultrasound (cw-Doppler).** [16]

→ **In presence of PAD a vascular work-up is mandatory and revascularization should always be considered.** [3,4]

→ **Always consider neuro-angiopathic etiology, especially if non-plantar ulcers, multiple ulcers on the same foot (≥ 3), no wound size reduction by > 50% in 4 weeks under optimal management, presence of other atherosclerotic disease (cardiovascular & cerebrovascular) or in patients on dialysis.**

→ **Before any amputation a vascular work-up is needed.**

DFU with signs of INFECTION & PAD is a medical emergency
→ fast track: refer to level 3 care immediately (time is tissue)

** PAD is defined as ABI < 0.9, a history of a peripheral artery revascularization procedure, or a history of amputation due to atherosclerotic disease*

Diagnosis

Issue	Action
1. Clinical Assessment for PAD	• Check pulses for dorsal pedal and posterior tibial arteries. → *Occlusion, medial artery calcinosis and anatomic anomaly can limit pulse palpation at dorsal pedal artery & posterior tibial artery.* [5] → *When in doubt: consider «no pulse».* • Assess capillary refill time at toes and heel [6] Note: At ulcer site refill time can be normal (< 3sec) due to local inflammation. • Check skin temperature & color, identify signs of diminished nutritive arterial perfusion. → Loss of body hair, poor nail growth. → *Signs & symptoms of PAD are unreliable because of loss of pain sensation and distal arterial obstruction in diabetics.* [5,6]
2. Diagnostic test for PAD	• Check for ABI, Toe pressure, TBI, TcpO2° and Doppler arterial waveforms at rest. → *Medial arterial calcifications present in 30 % of patients (incompressible arteries, ABI ≥ 1.4) bear the risk of overestimating arterial perfusion pressure.* *Note: No single* **test** *is optimal to rule out PAD.* [2,3,4]

° transcutaneous partial oxygen pressure

Diagnosis

Issue	Action
3. Vascular imaging	• Repetitively consider vascular imaging in all patients with DFU and PAD if wound size reduction is not > 50% in 4 weeks under optimal management (offloading, treatment of infection). This applies irrespective of the results of clinical assessment and bedside tools.[4,6] • Arterial ultrasound imaging is the mainstay for primary evaluation and should be performed by an expert qualified by the SSUM* or certified FMH Angiology or Radiology. • Additional imaging techniques are part of the vascular specialist`s decision. The choice of the technique should be determined in an individualized approach, including risk–benefit assessment. For planning revascularization procedure additional imaging is usual.

Assessing severity

Issue	Action
ABI < 0.5	Vascular imaging and urgent revascularization needed.
ABI ≥ 1.4	Medial arterial calcification, consider vascular imaging especially if wound size reduction is not > 50% in 4 weeks under optimal management. [6,7]
Ankle pressure < 50 mmHg	Vascular imaging and urgent revascularization needed.
TcpO2 < 25 mmHg	Vascular imaging and urgent revascularization needed.
Toe pressure < 30 mmHg	Consider vascular imaging and urgent revascularisation.
TBI < 0.7	Consider urgent revascularisation.
Test interpretation *Prognosis°*	Relevant PAD can be largely excluded in the presence of ABI > 0.9 and < 1.4 and TBI > 0.7 and Triphasic pedal Doppler arterial waveforms.[3,4]

** Swiss Society of Ultrasound in Medicin (SSUM)*

° The FONTAINE classification is not valid due to loss of sensation as a result of peripheral diabetic sensory neuropathy.

Management

Issue	Action
1. Healing probability	· Basic assessment ABI < 0.5 **and** ankle pressure < 50 mmHg is associated with an increased risk of 40% for major amputation. [8] · Advanced assessment Skin perfusion pressure ≥ 40 mmHg, TcpO2 > 25 mmHg or toe pressure > 45 mmHg is associated with an increased healing probability by at least 25%. [8] *Note: There are no highly predictive **cut-off values** by a single test for arterial foot supply to predict wound healing or not.* · Important co-factors for non-healing in PAD [9] 1. Infection 2. End-stage renal disease (=dialysis) 3. Ulcer located to the heel 4. Multiple ulcers 5. Ulcer size > 1 cm^2 and depth beyond superficial tissue

Issue	Action
2. Triage / Revascularization	· In presence of PAD, management in an interprofessional footcare team is strongly recommended. [10] *Note: «Time is tissue» – delayed or inadequate treatment leads to the irreversible loss of portions of foot tissue.* [3] · Urgent patient management, including assessment and revascularization is recommended in presence of [1,3,8,11] → critical limb ischemia (ABI < 0.5 or ankle pressure < 50 mmHg or toe pressure < 30 mmHg or TcpO2 < 25 mmHg) OR → PAD + moderate or severe infection (IDSA 3/4)

Urgent management should also be considered in patients with PAD and higher pressure levels in the presence of other predictors of poor prognosis, especially infection or large ulcer surface area.

Management

Issue	Action
3. Revascularization	• Full lower extremity angiography down to the plantar arches is mandatory to explore all revascularization options. [3] • The principle of revascularization is to restore blood flow to the foot with at least one direct line from the aorta to the foot arteries. • A direct revascularization of the artery that supplies the anatomical region of the wound (angiosome) is preferable. Restoration of direct flow to the foot can reduce time to ulcer healing. [12] • The aim of revascularization is achieving a minimum skin perfusion pressure ≥ 40 mmHg; a toe pressure ≥ 30 mmHg; or, a TcpO2 ≥ 25 mmHg. [3,8] • Endovascular revascularization should be the first attempt and options for venous bypass should be individually discussed. • Decisions about type of revascularizations (endovascular or open surgery) should always be discussed in multidisciplinary team, ideally consisting of angiologists, interventional radiologists and vascular surgeons.

Follow-up

Issue	Action
1. Follow-up	• Follow-up is guided by type and technical success of revascularization and the wound healing progress. [13] • Monitoring arterial perfusion status and considering re-intervention with respect to wound healing progress are key factors to achieve wound healing. • For patients with a healed DFU a complete annual vascular work-up is mandatory, as is a follow-up by a multidisciplinary foot care team. [9,10]
2. Secondary prevention	• All patients with diabetes and PAD should receive aggressive cardiovascular risk management including support for cessation of smoking, treatment of arterial hypertension. • Intensive LDL-cholesterol lowering reduces risk for major cardiovascular events* and major adverse limb events.** [14] • Statin therapy is associated with an increased amputation-free survival patients with CLI.° [15] • Clopidogrel is the preferred antiplatelet drug. [3] • Advantageous effects on risk reduction for ischemic events by a combination of aspirin/low-dose rivaroxaban. [17]

** composite of cardiovascular death, myocardial infarction (MI), stroke, hospitalization for unstable angina, or coronary revascularization*

*** composite of acute limb ischemia (ALI), major amputation*

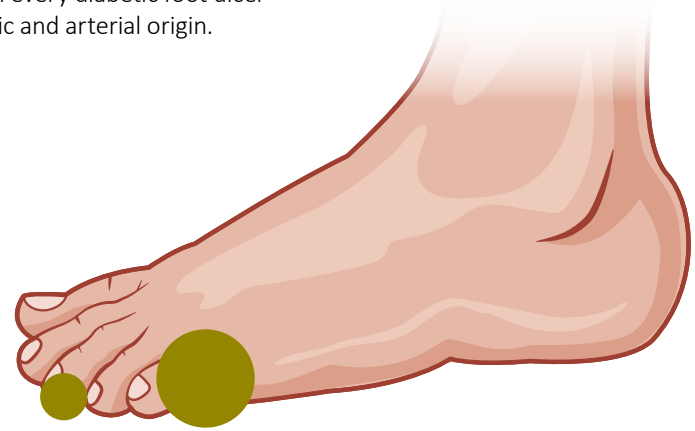
° CLI defined as ABI <0.4 or ischemic rest pain or both, with and without tissue loss

Ischemic diabetic foot – Organization of care

Level	Triage for referral to higher level
Level 1a *Health care providers with experience in the assessment of peripheral arterial perfusion*	• Presence of PAD (ABI < 0.9 – ≥ 1.4) → ***Level 2*** • Lack of foot pulse on palpation → ***Level 2*** • Presence of Necrosis → ***Level 3*** • PAD and moderate or severe infection (IDSA 3/4) → ***Level 3***
Level 1b *General practitioner with experience in assessment of peripheral arterial perfusion*	• Non-healing defined as wound area decrease < 50% within 4 weeks despite optimal management → ***Level 2*** • PAD and moderate or severe infection (IDSA 3/4) → ***Level 3***
Level 2 *Off-site network of specialists in vascular work-up*	• Necrosis → ***Level 3*** • PAD and moderate or severe infection (IDSA 3/4) → ***Level 3***
Level 3 *Interprofessional Footcare-Team*	

Typical localisation of ischemic ulcers

Consider in every diabetic foot ulcer neuropathic and arterial origin.



Patients with signs of PAD and a foot infection are at particulary high risk for major limb amputation and require emergency treatment.[(1)]

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Subgroup ischemic diabetic foot syndrome
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Organizations
[1] Swiss Family Doctors and Paediatricians
[2] Swiss Organisation of Podiatry
[3] pharmaSuisse
[4] QualiCCare
[5] Swiss Society of Vascular Surgery
[6] Swiss Association for Woundcare
[7] Swiss Society of Angiology
[8] Swiss Society of Endocrinology and Diabetology
[9] Swiss Society of Infectiology
[10] Swiss Society of Vascular and Interventional Radiology
[11] Swiss Interest Group of Diabetes Nurses
[12] Swica Insurances
[13] Swiss orthopaedics
[14] Foot and Shoe Association

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