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Review article – *Special issue: Panvascular medicine*

Panvascular disease – Diagnosis and management

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ABSTRACT

Panvascular disease (PVD) increases significantly the risk for cardiovascular events (myocardial infarction, stroke and cardiovascular death); the more sites affected, the greater the risk of a major cardiac event. Despite its high incidence and severe cardiovascular prognosis, PVD has still not been well studied. History of risk factors and co-morbidities, as well as a detailed physical examination, are mandatory in the initial screening and diagnostic work-up. The ankle-brachial index and various non-invasive imaging methods such as duplex ultrasound, computed tomography or magnetic resonance angiography are used for the diagnosis of atherosclerosis in various vascular beds, while digital subtraction angiography is currently used almost exclusively in association with endovascular procedures. Appropriate utilization of techniques is based on international guidelines and a multidisciplinary discussion for each case.

Management of a patient diagnosed with PVD can be very complex. Secondary preventive measures and aggressive medical treatment are needed to reduce excess cardiovascular risk. Whether routine screening for atherosclerosis at various sites in the arterial tree in all or selected patients may alter treatment to improve outcome in these patients has not been shown.

In the lack of hard evidence, individualized decision-making is needed with the collaboration of many specialties in a multidisciplinary approach. In general, the more symptomatic lesion or the lesion with the strongest prognostic impact should be treated first. In selected cases combined interventions can be done. Perioperative cardiovascular complications are common in patients with PVD, thus preoperative targeted screening may be needed.

Clinical studies are needed to identify more effective approaches to diagnose and treat these patients. A single trial performed so far failed to demonstrate a panvascular screening in patients with severe coronary artery disease. Meanwhile, a multidisciplinary team is often needed to optimize short- and long-term prognosis.

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Abbreviations: ABI, ankle brachial index; ACS, acute coronary syndromes; CABG, coronary artery bypass graft surgery; CAD, coronary artery disease; CAS, carotid artery stenosis; CEA, carotid endarterectomy; CTA, computed tomography angiography; CV, cardiovascular; LEAD, lower-extremity artery disease; LOE, level of evidence; MI, myocardial infarction; MRA, magnetic resonance angiography; PAD, peripheral arterial disease (any site); PCI, percutaneous coronary intervention; PVD, panvascular disease; RAD, renal artery disease; TIA, transient ischemic attack.

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Contents

Diagnosis

Panvascular disease (PVD) or multisite artery disease is defined as the simultaneous presence of clinically relevant atherosclerotic lesions in at least two major vascular territories [1]. The diagnosis of PVD, especially in patients with proven atherosclerosis at one site, is primarily based on a thorough medical history and a detailed clinical examination including blood pressure measurement in the arms and legs to derive ankle-brachial index (ABI) [1,2]. In case of clinical suspicion, focused non-invasive imaging using ultrasound as a first-line method and then computed tomography or magnetic resonance angiography as second-line methods may follow (Table 1) [3].

Medical history should include all known cardiovascular (CV) risk factors and co-morbidities. All types of symptoms suggestive of vascular disease should be systematically sought [1,2]. These may be:

- chest pain or other symptoms (e.g. shortness of breath) suggesting angina (on exertion or at rest)
- any walking impairment, e.g. fatigue, aching, cramping, or pain localized anywhere in the lower limb from the buttock to the thigh, calf, or foot, particularly when symptoms are quickly relieved at rest
- any pain at rest localized to the lower leg or foot and its association with the upright or recumbent position
- any poorly healing wounds of the extremities

Table 1 – Non-invasive methods to detect atherosclerosis.

Imaging technology	Component detected	Relation to disease	Advantages	Limitations
Ankle-brachial index	Difference in upper and lower limb blood pressures because of significant atherosclerotic plaque	Presence of significant atherosclerotic stenosis Predictor of cardiovascular events	Easy Rapid Reproducible Relatively cheap	Cannot identify location of stenosis
Ultrasound	Intima media thickness Plaque extension Plaque composition: -Echolucency -Plaque-vascularization	Non-coronary arteries Pre-clinical atherosclerosis Plaque burden Plaque vulnerability	No radiation Bedside Cheap	Poor acoustic window (calcified lesions) Operator-dependent
Electron beam computed tomography	Coronary artery calcification	Coronary plaque burden Predictors of coronary events	Easy Rapid Automated Reproducible Relatively cheap	Low-dose radiation
Multidetector computed tomography	Coronary artery anatomy Plaque composition	High negative predictive value (high-risk plaque)	Relatively easy Rapid Reproducible	High-dose radiation Renal failure (contrast medium) High costs
Magnetic resonance	Plaque burden Remodeling Plaque composition (coronary anatomy)	Atherosclerosis extension Plaque burden High-risk plaque	No radiation Reproducible	Cumbersome High costs Renal failure (contrast medium)
Positron emission tomography	Macrophages Uptake proportional to the number of macrophage in inflammatory plaques	Association between embolic events distal to FDG PET-positive carotid stenoses	Highly reproducible	Nonspecific uptake by cells Other than inflammatory cells Very high radiation

Modified from reference [3].