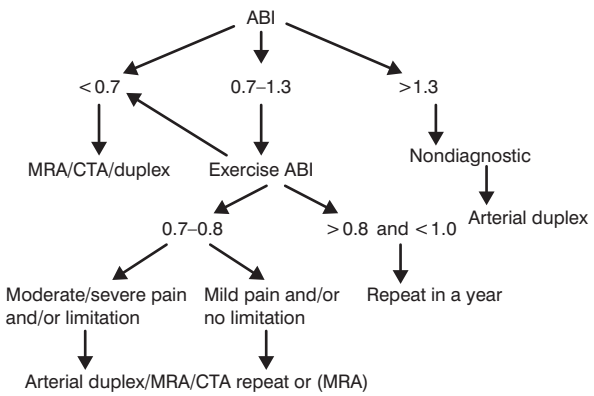
Figure 1. Algorithm for Ankle-Brachial Index Assessment of Arterial Insufficiency



ABI, ankle-brachial index; CTA, computed tomography angiography; MRA, magnetic resonance angiography.

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atherosclerosis. Hallmark symptoms of PAD include claudication with resulting decreased function and exercise capacity, with symptoms ranging from Rutherford–Becker Classification 0 (no symptoms) to 6 (gangrene). In addition, PAD is associated with a heightened risk of all-cause mortality. Therefore, it is important that clinicians do not miss a diagnosis of PAD. To diagnose PAD, an ankle-brachial index (ABI) should be performed. In patients with a compelling story but a normal rest ABI, an exercise ABI should be considered (Figure 1).

Venous issues are a substantial problem in the United States, because, according to Dr Niazi, almost 5% (about 25 million) of individuals in the United States suffer from leg vein abnormalities, and venous stasis ulcer is the most common leg ulcer that presents in wound centers. Despite this large number, only 1.7 million patients seek treatment for their vein issues. Multiple risk factors for vein problems exist, including age, female sex, genetic predisposition, an occupation that requires a lot of standing, pregnancy, and taller height. Vein problems encompass a variety of conditions such as varicose or spider veins, leg cramps, restless legs, itching, ulcers, aching or heaviness, and swelling.

Dr Niazi recommends that all cardiologists have new patients remove their socks and shoes to examine the legs and feet; abnormal pigmentation of the lower legs is very common in patients with venous insufficiency. A common cause of venous insufficiency is malfunction of the venous valves, which do not close completely and allow the blood to travel back; the resulting increased venous pressure can cause distention of the veins and result in bleeding. The diagnosis of venous insufficiency can be made easily with venous ultrasound, which is performed while the patient is standing. The calf region should be compressed, causing blood to surge upward; in patients with venous insufficiency, the blood will fall downward again.

In conclusion, it is important that cardiologists are aware of vasculature issues that occur beyond the heart. Many potentially serious issues are a result of atherosclerotic disease, which often exists in multiple vascular beds.

Bioresorbable DESs May Address Traditional DES Limitations

Written by Mary Mosley

Patients with coronary artery disease (CAD) undergoing percutaneous revascularization are treated with either drug-eluting stents (DESs) or bare metal stents. Although new generations of DESs have been developed, these stents continue to have some limitations. Bernard Chevalier, MD, Institut Cardiovasculaire Paris Sud, Massy, France, presented current data on the bioresorbable DESs that are in development.

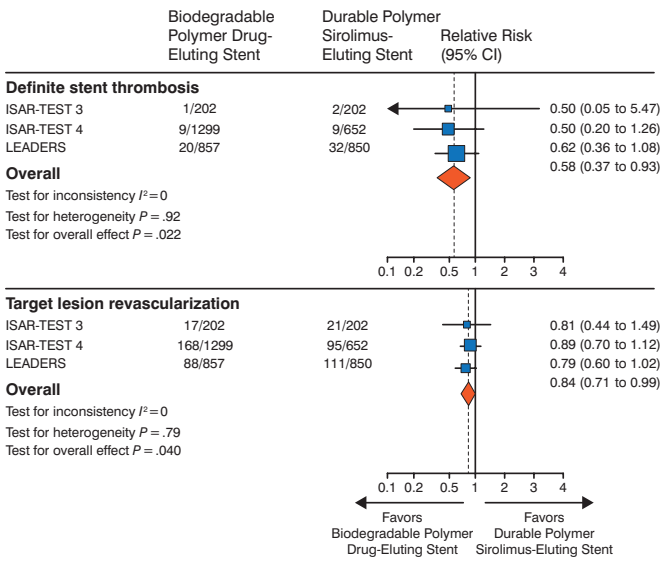
First-generation, polymer-based DESs had multiple limitations. The polymer was fragile, resulting in uneven drug distribution that increased the risk of focal in-stent restenosis. The kinetics of drug release were not consistent and increased the risk of diffuse restenosis. Some stents had prolonged elution of the medications designed to prevent restenosis that delayed endothelialization of the stents and increased the risk of stent thrombosis. Subsequent generations of DESs have sought to eliminate these issues.

DESs with biodegradable polymers are under development in an effort to avoid long-term inflammation and improve clinical outcomes. In the LEADERS trial [Stefanini GG et al. *Lancet*. 2011], patients with CAD were randomized to either a biodegradable biolimus-eluting stent (BES) or a durable polymer sirolimus-eluting stent (SES) and were followed for 4 years. The biodegradable BES was noninferior to the durable polymer SES for the end points of target lesion revascularization (TLR) and definite stent thrombosis (Figure 1).

The NEXT trial [Natsuaki M et al. *J Am Coll Cardiol.* 2013] demonstrated that TLR and stent thrombosis occurred at similar, but very low, rates among patients who received the biodegradable BES compared with the durable polymer SES.

The CENTURY II trial [Saito S et al. *Eur Heart J.* 2014] randomized patients to either the bioresorbable Ultimaster SES or the permanent Xience everolimus-eluting stent. The Ultimaster stent is made of a PDLLA-PCL copolymer that is resorbed within 3 to 4 months. By contrast, the Xience DES

Figure 1. Biodegradable Vs Durable Polymer Drug-Eluting Stents



Adapted from *The Lancet*, 378, Stefanini GG et al. Long-term clinical outcomes of biodegradable polymer biolimus-eluting stents versus durable polymer sirolimus-eluting stents in patients with coronary artery disease (LEADERS): 4 year follow-up of a randomised non-inferiority trial. 1940–1948. Copyright © 2011, with permission from Elsevier.

contains a PVDF-HFP nonerodible fluorinated copolymer and is permanent. Patients treated with the Ultimaster stent had a 0.40% higher rate of freedom from target lesion failure (95% CI, –2.22 to 3.02; $P = .0001$) at 9 months. In the cohort of patients from Japan, the cumulative incidence of TLR events was 4.14% (95% CI, 2.52 to 6.78) and 5.67% (95% CI, 3.69 to 8.64) in the Xience arm.

A variety of other bioresorbable stents, including both polymer- and nonpolymer-based stents, and stents that elute everolimus, novolimus, and sirolimus, have undergone animal and clinical trials. To date, none of the bioresorbable stents are approved for use in the United States. In Europe, only Abbott's BVS 1.1 polymer-based stent is available for clinical use.

Prof Chevalier described clinical challenges that might arise when deploying bioresorbable stents. Bioresorbable stents are susceptible to mechanical deformation of stent strut with delivery. In addition, as the stent polymer erodes, the radial strength of the polymer decreases, which could result in late lumen loss. The ABSORB II trial [Diletti R et al. *Am Heart J.* 2012] randomized patients in a 2:1 fashion to receive the Absorb bioresorbable stent or the Xience stent. The primary end points of the study are based on changes in lumen diameter.

Prof Chevalier highlighted that the current limitations of the bioresorbable DES include a large profile (> 1.4 mm), decreased radial strength over time, and limited ability to increase the diameter using postdilation inflations. The potential benefits of a bioabsorbable stent would not begin until after the PCI (eg, strut resorption, conformability, pulsatility, vasomotoricity, plaque regression, and positive remodeling). He cautioned that bioresorbable DESs have been evaluated in a relatively small number of patients and have only been used to treat simple lesions.

Current work is focused on developing thinner stent struts with a lower profile in an attempt to reduce occlusion of small side branches. Other areas of work include increasing the ability the stents to be sized further after deployment and the development new polymers and strut designs. In the meantime, Prof Chevalier pointed out that lesion preparation and appropriate sizing are important prior to deployment of a stent, particularly in bioresorbable stents, in order to prevent mechanical deformation and to achieve the best possible outcomes.

In conclusion, Prof Chevalier stated that the new, bioresorbable stents are deliverable, can be used at bifurcations, are cost-effective, and are compatible with short-term dual antiplatelet therapy. Current data suggest that bioresorbable DESs have similar short-term efficacy and safety as permanent DESs but data on long-term outcomes are needed.

RDN: Its Current Place in the Treatment of Resistant Hypertension

Written by Mary Mosley

Renal denervation (RDN) with percutaneous, catheter-based radiofrequency ablation was shown to reduce blood pressure (BP) in patients with true treatment-resistant hypertension in the initial registry of RDN [Schlaich MP et al. *Hypertension.* 2009] and in the Symplicity HTN trials [Symplicity HTN-1 Investigators. *Hypertension.* 2011; Symplicity HTN-2 Investigators. *Lancet.* 2010].

However, the promising results found in these trials of reductions in systolic blood pressure (SBP), such as –33 mm Hg at 3 years in the nonrandomized Symplicity HTN-1 trial ($P < .01$ vs baseline) and –32 mm Hg at 6 months in seated office SBP versus sham ($P < .0001$) in the randomized Symplicity HTN-2 trial, were not supported by the results of the Symplicity HTN-3 trial [Bhatt DL et al. *N Engl J Med.* 2014]. No significant difference was found for the primary efficacy end point of change in office SBP at 6 months between the denervation and sham groups (–2.39 mm Hg; 95% CI, –6.89 to 2.12; $P = .26$).

A number of potential explanations have emerged for the negative results in Symplicity HTN-3 and were reviewed by Oscar A. Mendiz, MD, Favaloro University,