

## Acute Peripheral Arterial Insufficiency and Hyperbaric Oxygen

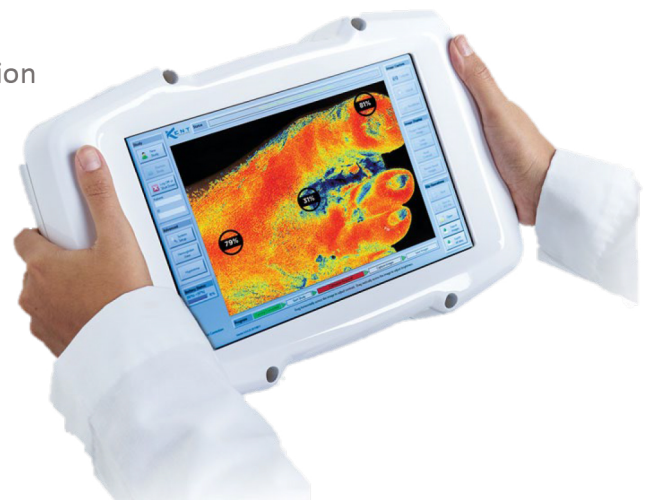
Peripheral arterial disease (PAD) affects 8-12 million people over the age of 40 years in the United States. PAD results in tissue ischemia due to atherosclerosis of the aorta, iliac, and lower extremity arteries. The 10 –year mortality rate nears 60% and is dependent on age and arterial insufficiency (AI) severity. Many patients who develop arterial insufficiency ulcers (AIU). AIUs often fail to heal despite standard management that includes revascularization, addressing systemic factors (e.g. tobacco use, diabetes, hypertension, hyperlipidemia, obesity), offloading, treatment of infections, appropriate local wound care, and appropriate debridement in the setting of adequate tissue oxygen perfusion.

Many of these patients are not candidates for revascularization. The result of nonhealing in many cases is above-ankle amputation, which increases patient morbidity and mortality risks. The overall prognosis is dependent on the location and degree of arterial stenosis and ability to revascularize. With revascularization, the healing rates have been reported at 50-90% and amputation rates of <20%. Without revascularization the results change dramatically with healing rates of only 40-50% and amputation rates increasing to 25-40%.

Hyperbaric oxygen (HBO) is one adjunctive therapy to consider in patients with AIU not responding to standard care. The delivery of oxygen at higher than atmospheric pressure results in increased arterial oxygen tensions and increased concentrations of oxygen in the plasma, thus driving oxygen into otherwise hypoxic injured tissue. HBO has both a local and systemic effect. Locally, HBO increases multiple growth factors including nitric oxide (NO). Systemically, HBO induces bone marrow NO production and results in progenitor stem cell release from bone marrow. As a result, there is neovascularization at the site of hypoxic tissue such as nonhealing ischemic lower extremity ulcers. Notably, there is evidence patients with advanced PAD have a decreased in NO bioactivity and nitrate metabolism which is likely the result of inhibition of nitric oxide synthase (NOS). HBO has been found to increase NO levels through direct activation of NOS.

### Benefits of HBO include:

- Increased collagen and extracellular matrix protein deposition
- Increased oxygen diffusion distance from the capillaries
- Improved leukocyte-bacterial-killing
- Increased effectiveness of antibiotics
- Improved local tissue oxygenation
- Activated stem cell mobilization
- Decreased local tissue edema
- Increased angiogenesis
- Reduced inflammation
- Reduced apoptosis



### References

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- Goldman, Robert J. "Hyperbaric oxygen therapy for wound healing and limb salvage: a systematic review." *PM&R* 1.5 (2009): 471-489.