

# The Use Of Pressurized Cyclical Topical Oxygen Therapy\* Can Be Used To Facilitate And Maintain Wound Closure In Diabetics With Peripheral Arterial Disease And Osteomyelitis

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## Introduction:

Pressurized cyclical topical oxygen therapy (TOT) has been proven beneficial to healing diabetic foot ulcers in randomized controlled trials, real world evidence studies, and meta-analysis<sup>1,2,3</sup>. Little evidence has been published to discuss its effectiveness in patients with peripheral arterial disease (PAD) and osteomyelitis.

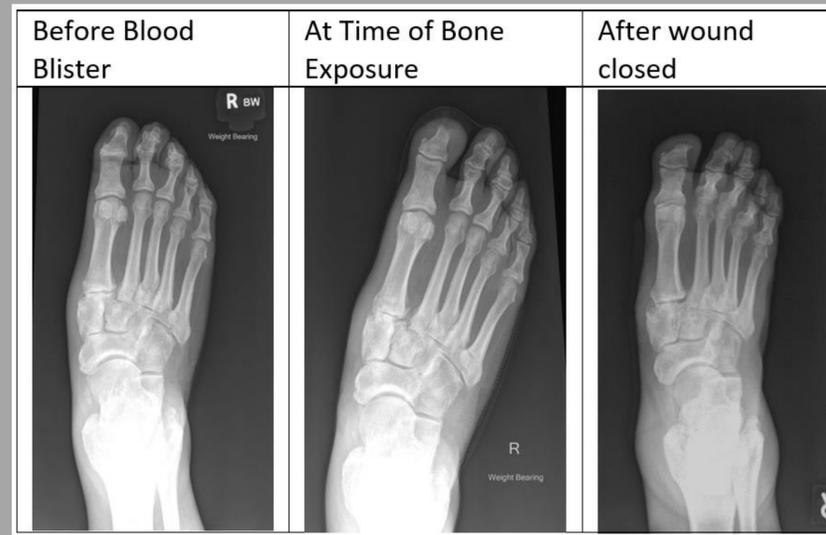
A 75 y/o male DM with neuropathy, bilateral Charcot neuroarthropathy deformities and PAD presented with a distal right hallux blood blister, then partial nail loss, with rapid breakdown into a full thickness ulcer with underlying osteomyelitis. Transcutaneous oxygen pressure (TCPO2) was found inadequate in both feet (R medial foot 17mmHg).

## Methods:

Pressurized cyclic topical oxygen therapy was ordered for application with dressings removed. Santyl that was applied to the wound base was wiped out and cleansed before TOT use, followed by foam, gauze, and tetra netting. A bone biopsy preformed once bone was exposed revealed multi-organism osteomyelitis confirmed on probe-to-bone exam and xray findings. ID recommended Augmentin for 6 weeks or longer and subsequently extended to 12 weeks.

Wound Week	Size	SA	Structures	Dressing	ID Intervention	Pain	TOT
Blood blister	Not measured	n/a	Blister	DSD, betadine		No pain	
Initial wound	0.5 x 0.5 x superficial	.25	Nail 50% off	Santyl, foam, gauze, tetra netting		Pain (2) reported	AOTI BID No dressing
Week 1	2.2 x 1.6 x bone	3.52	Bone	Santyl, foam, gauze, tetra netting	Bone biopsy	Pain (2) reported	AOTI BID No dressing
Week 2	1.9 x 1.7 x 0.3	3.23	Bone	Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain (2) reported	AOTI BID No dressing
Week 3	1.6 x 1.2 x 0.3	1.92	Bone	Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain (2) improving	AOTI BID No dressing
Week 4	1.1 x 0.5 x 0.3	0.55	Bone	Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain gone	AOTI BID No dressing
Week 5	1.1 x 0.3 x 0.3	0.33		Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain gone	AOTI BID No dressing
Week 6	0.8 x 0.2 x 0.3	0.16		Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain gone	AOTI BID No dressing
Week 7	0.8 x 0.2 x 0.3	0.16		Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain gone	AOTI BID No dressing
Week 8	0.8 x 0.2 x 0.3	0.16		Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain gone	AOTI BID No dressing
Week 9	Not seen	n/a		Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain gone	AOTI BID No dressing
Week 10	0.5 x 0.1 x 0.2	0.05		Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain gone	AOTI BID No dressing
Week 11	0.5 x 0.1 x 0.2	0.05		Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain gone	AOTI BID No dressing
Week 12	Not seen	n/a		Santyl, foam, gauze, tetra netting	Antibiotic therapy	Pain gone	AOTI BID No dressing
Week 13	closed	n/a		foam, gauze, tetra netting	Antibiotic completed	Pain gone	AOTI BID No dressing
Week 15	Closed	n/a		foam, gauze, tetra netting		Pain gone	AOTI BID No dressing

TCPO2 Results	R foot medial 17; R foot lateral 31; R leg 52	L foot 33
ABI Results	R 1.21	L 1.67 NC
Bone biopsy results	Actinomyces naeslundii, streptococcus anginosus, staphylococcus epidermidis, naemophilus parainfluenzae, eikenella corrodens, parvimonas micra	
Labs	HgA1c 7.5%, ESR 7, CRP 5	
Medications	Insulin, gabapentin, glipizide, isosorbide mononitrate, nitroglycerin, amlodipine, vit C, vit D, iron, flaxseed, metroprolo, solifenacin, tamsulosin, losartan, melatonin, finasteride	



## Results:

The toe became painful in the setting of gross lack of sensation and pain. After initial TOT use, the patient reported pain reduction with each use and once the bone was no longer exposed. After a couple of weeks of TOT therapy, the pain had completely resolved. The wound eventually closed around week 12 and was confirmed closed at week 13 and 15. The patient continued to use TOT between weeks 13 and 15 along with the same dressing for protection. The wound remains closed, and the osteomyelitis remains in remission 2 years later.

## Discussion:

TOT has benefits beyond standard of care when used to treat diabetic foot ulcers and has demonstrated quicker time to wound closure, decreased hospitalization and decreased amputation rates<sup>1,2</sup>. DFU's are complex and often the patient has many other factors that impact healing. This case demonstrates that even when there is inadequate TCPO2, bone exposure, and osteomyelitis, pressurized cyclic topical oxygen therapy can be used to achieve positive limb saving outcomes.

## References:

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- 2) Yellin, J. I., Gaebler, J. A., Zhou, F. F., Niecko, T., Novins, O., Ockert, A., Krzynowek, D., Garoufalos, M. G., Lee, A. M., & Frykberg, R. G. (2021). Reduced Hospitalizations and Amputations in Patients with Diabetic Foot Ulcers Treated with Cyclical Pressurized Topical Wound Oxygen Therapy: Real-World Outcomes. *Advances in Wound Care*, 10.1089/wound.2021.
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