

Pain Diagnostics and  
Interventional Care

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Pictured above is Dr. Provenzano (Left) and Alex Keith (Right).

Alex is a summer research intern at Pain Diagnostics and Interventional Care completing research on methods to reduce infection by understanding *Staphylococcus aureus* colonization rates. His research is focused on classifying the prevalence of bacteria seen on patients prior to undergoing implantable pain therapy treatments.

#### Mission Statement

To professionally and passionately provide evidence-based medical care for patients with various pain states and to advance the science of pain medicine through research and education.



**Pain Diagnostics**  
*& Interventional Care*

## Diabetic Neuropathy

### What is Diabetic Neuropathy?

Diabetic neuropathy (DN) is a type of nerve damage that can result in diabetic individuals. Typically, the nerve damage occurs in the extremities of affected individuals – known as peripheral DN (PDN) – however, there are three other types of diabetic neuropathy (autonomic neuropathy, proximal neuropathy, and mononeuropathy). While the exact cause of each type of neuropathy is unknown, researchers believe that uncontrolled hyperglycemia (elevated blood sugar) can result in increased vascular resistance leading to inadequate nutrients and oxygen being supplied to the nerves. Subsequently, the undernourished nerves will begin to degenerate leading to the symptoms of one of the four types of DN. Of the 425 million adults worldwide with diabetes, it is estimated that approximately 20% of type I diabetics and approximately 10 to 50% of type II diabetics depending on the disease duration will develop PDN.

### Symptoms of Diabetic Neuropathy

Symptoms of PDN primarily affect the extremities and commonly include numbness, tingling, burning, sharp pains, increased sensitivity to touch, reduced ability to feel pain or temperature changes, and foot problems such as ulcers, infections, and bone / joint pain. In cases involving serious infection, PDN may even warrant amputation of the affected limb. By closely managing blood sugar and monitoring any foot problems, diabetic individuals can prevent or delay PDN and its associated complications.



## Contact us!



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### Reference

Petersen EA, Stauss TG, Scowcroft JA, et al. Effect of High-frequency (10-kHz) Spinal Cord Stimulation in Patients with Painful Diabetic Neuropathy: A Randomized Clinical Trial. *JAMA neurology*. 2021;78(6):687-698.

## Current Treatment Options for Diabetic Neuropathy

The most current treatments for DN are largely pharmacological interventions and include neuropathic pain medications such as gabapentinoids, serotonin-norepinephrine reuptake inhibitors, tricyclic antidepressants, opioids, and topical solutions. However, the efficacy of these medications has been reported as limited in multiple high-quality randomized clinical trials. Specifically, it was found that of patients taking gabapentin for PDN, a mere 1 in 6 was helped. Furthermore, the long-term patient adherence to pharmacological medical management of DN is poor. For gabapentin and pregabalin (common gabapentinoids prescribed for DN affected individuals), it is estimated that greater than 60% of patients will discontinue the medication after just six months. Additionally, it has been reported that many of these patients do not seek alternative therapy, rather they allow the DN to progress without treatment. Alternatively, a recent study found that low-intensity resistance training and



## Spinal Cord Stimulation and Diabetic Neuropathy

As mentioned above, the limited efficacy of medical management for DN has placed focus on treatment options elsewhere in current research and medicine. Namely, spinal cord stimulation (SCS) has emerged as an effective nonpharmacological treatment option for DN affected patients. SCS produces effective pain relief modulating the processing of pain in the spinal cord.

In a recent study comparing the HF10 SCS therapy plus Conventional Medical Management (CMM) to CMM alone, it was discovered that patients in the SCS therapy group obtained substantial pain relief and improved health-related quality of life over a six-month period of time.

Recently, the FDA announced the approval of 10 kHz high frequency SCS therapy for treatment of chronic pain associated with painful diabetic neuropathy. The 10 kHz SCS will serve as an evidence-based treatment option to better address DN patients that have been unable to obtain significant pain reduction through pharmacological intervention.