

Plantar Fibroma—A New Approach to Treatment Using the Cryostar Cryoanalgesia System

Using this technique offers a new option for dealing with a common problem.

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Plantar fibromas are characterized by the proliferation of generally mature fibroblasts, associated with mature collagen, and often by a local infiltrative tendency. Some fibromas may be present at birth, develop in early childhood, or appear in adulthood. Some clinicians refer to this disease entity as Dupuytren's contracture of the plantar surface of the foot. The same condition forms in the palmar surface of the hands and is commonly referred to as Ledderhose disease.

Pathophysiology

Plantar fibroma represents not a single entity, but rather, a heterogeneous group of conditions with the common characteristics of plantar location and histologic features of mature collagen and fibroblasts with no malignant cytologic features. These tumors tend to grow within the plantar fascia. Frequently, they grow slowly and do not cause much discomfort until they get quite large in size.

Dupuytren's contracture was first reported in 1831. Some of the common causes are believed

to be repeated trauma, long-term alcohol consumption, chronic liver disease, diabetes, and epilepsy in middle-aged or elderly patients. Heredity is also a clear factor in many patients. There is also an association with taking the drug Dilantin.

Diagnosis

Diagnosis can be made by clinical examination. Fibromas appear as palpable nodular firm lesions on the plantar aspect of the foot. Biopsies are not usually advised as this procedure can cause fibromas to enlarge. Ultrasound is one way of making the diagnosis. On ultra-sound the nodules are hypoechoic and appear as droplets of water adhering to the plantar surface of the fascia.

Today, with the use of magnetic resonance imaging (MRI) the diagnosis can be made rather easily.



Figure 1: Pre-op right foot fibroma.

New Concepts

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Treatment

Over the years, there has been a wide variety of different treatment alternatives of which all have their pitfalls. Surgical intervention often leads to recurrence of fibromas.

When these fibromas reoccur, they usually are larger in size than previously. There is also potential for the fibroma to become entrapped in the plantar nerves. There is also a concern about plantar scarring, and weight bearing becomes an issue as well.

Some advocates suggest that removal of the entire plantar fascia is the only way to eliminate recurrent fibromas. Conservative treatments have ranged from various soft orthotics made of Plastazote or PPT to accommodate these treatments and other types of physiotherapy have been suggested. Intralesional steroid injections have met with some limited success. This entity presents a challenge for all podiatrists who try to eradicate these painful tumors. I have found

that the use of cryoanalgesia is a new and innovative type of treatment that may finally be the answer to this difficult problem.

Principals of Cryoanalgesia

Cryotherapy is not a new concept to help alleviate pain. Hippocrates recognized the analgesic and anti-inflammatory properties of ice on injuries back in 430 BC.

Cryoanalgesia—or cryoablation, as it is also referred to—is a minimally invasive procedure that uses extremely cold temperatures to selectively destroy nerve endings. In this process, which is not tissue-specific, tissue is frozen by using the Joule-Thomson effect within a “closed-probe” gas-based system.

The process of cell destruction is brought about by free expansion of a cryogen gas (nitrous oxide or carbon dioxide) within the



Figure 2: Patient receiving PT nerve block



Figure 3: Local infiltration of Marcaine with epinephrine directly into the fibroma



Figure 5: 2.0mm. Trochar with pointed tip



Figure 4: Puncture into the fibromas using a #67 Beaver blade



Figure 6: Initial puncture being made into the fibroma

cryoprobe tip. As this happens the surrounding tissue temperature will drop rapidly, from 30 to 60 degrees C per second, (down to -79 degrees C, if using nitrous oxide). The resultant 6 to 8 mm ice ball formed at the cryoprobe tip will destroy nerve tissue by causing extensive vascular damage to the endoneural capillaries or vas nervorum. This then causes demyelination (break down of the myelin sheath) and Wallerian degeneration of the axon. An important feature of the procedure is that within the nerve structure both the perineurium and epineurium will remain intact, therefore preventing the formation of any amputation neuroma.



Figure 7: Additional puncture with 2.3 mm. trochar.



Figure 8: Cryoprobe inserted into the fibroma.

Cryoanalgesia has been used in medical practice since the early 1960's. Its history can be traced in chronic pain management, prostate and liver tumor reduction, as well as many other applications, including dermatology, eye and thoracic surgery. The Cryostar cryoanalgesia system has been developed and is manufactured by The Cryomed Group Ltd., Mansfield England, and is marketed and sold in the US, by Cryotech LLC in New Port Richey, FL. The system received its FDA approval in June of 2003 and was launched at the APMA Meeting in Washington, August 2003. Dr. Lawrence Fallat, of Dearborn, MI, has been instrumental in the development of the system and a range of cryoprobes, so that the technique of cryoanalgesia could be effectively introduced into the field of podiatric surgery. Dr. Fallat has already published a paper on the use of cryotherapy for treatment of lower extremity neuromas, and a second cryotherapy paper has now been written for the treatment of plantar fasciitis, published in *Biomechanics*.

Case Study

A 77 y/o Caucasian female presented herself to my office with a chief complaint of a painful large mass on the bottom of her right foot. The mass measured 4.5 cm's x 3.0 cm's. (Fig. 1) Prior treatment has consisted of surgical resection twice previously, intra lesional steroid injections, custom-molded inserts, and physiotherapy. The patient states that the mass grew bigger after both surgical attempts at excision. The mass appears to be consistent with a plantar fibroma. In addition, the area was painful to palpation and touch as she felt an "electric-type shooting pain" in her foot with even the lightest degree of touch. I made a diagnosis of a plantar fibroma with entrapment of the medial plantar nerve. The patient underwent a complete consultation informing her of what the objectives of cryosurgery are and how this may help eliminate her pain as well as shrink the fibroma. (All patients are

asked to fill out a clinical trial data form and rate their current level of pain prior to the performance of any procedure. The pain scale is on a level of 1 through 10, with 10 being the worst pain.) This patient rated her pre-surgical level of pain as a 9.

The Surgical Procedure

On August 7, 2004, the patient presented herself for surgical treatment of her plantar fibroma and nerve entrapment using the Cryostar Cryoanalgesia System. The patient consented to the taking of digital photography so that other podiatrists may benefit from this new technology. The patient was taken to the operating room where she was first given a posterior tibial nerve block with 5 ml's. of 0.5% plain Marcaine. (Fig. 2) Next, the fibroma was infiltrated with 8 ml's. of 0.5% Marcaine with epinephrine 1:200,000 for purposes of hemostasis. (Fig. 3) Pneumatic tourniquets are not necessary for these procedures. Next a sterile drape was placed under the surgical foot. Next, via the use of a #67 Beaver blade (Fig.4) a stab-type incision was placed into the central portion of the fibroma.

At this time a 2.0 mm. Pointed trochar (Developed by Dr Steven Goldstein and Irwin Stromeyer of C-med Surgical Inc.) was inserted through the puncture site. (Fig. 5) It was then pushed through the extreme fibrotic nature of the fibroma in different directions. (Fig. 6) This is to allow the cryoprobe to enter without bending or damaging the probe. Next, the larger 2.3 mm. trochar was inserted to enlarge the channels (Fig. 7) to allow the cryoprobe to enter and exit without any resistance.

The Cryostar probe was inserted into different sites (Figs. 8, 9, 10) within the fibroma.

Each treatment cycle consists of a three minute freeze cycle followed by a thirty-second defrost cycle. This fibroma was frozen with 5 freeze cycles due to its mass and size. One can now see the fibroma has been reduced in size and has a somewhat depressed central area (Fig. 11).

Upon finishing the 5-cycle freeze, 3 ml's. of 0.5% Marcaine were infiltrated into the fibroma along with 1 ml. of Dexamethasonesodium phosphate 4mg./ml. (Fig.12) Next, Bacitracin ointment was placed over the puncture site and a sterile dressing was applied consisting of sterile 4'x'4's, Kling, and Coban. (Fig. 13) The patient was given samples of Celebrex 200 mg to take for the next five days postoperatively. She was instructed to stay off her foot for the first 24hours and apply ice and elevate the foot. The patient was

then instructed that she may remove the bandage after 24 hours, take a shower, and apply Bacitracin and a Band-Aid over the puncture site for the next 5 days, until her first post-operative visit.

The first post-operative visit was on 8-16-04. The patient was again asked to rate her current level of pain. She enthusiastically stated it was between a 0-1.

The fibroma appeared significantly smaller in overall size, was softer and more pliable. More importantly there was no shooting nerve pain with palpation or touch. (Fig. 14, 15, 16).



Figure 9: Cryoprobe inserted in a different position.



Figure 12: Injection of steroid post cryo application



Figure 10: This demonstrated how far the probe was inserted



Figure 13: Post-op bandage in place.



Figure 11: Immediate post-op view showing smaller size of the fibroma



Figure 14: First post-op visit on 8-16-04.



Figure 15: Another view showing reduction in overall size.



Figure 16: Dramatic over-reduction in appearance with slight bruising."

Conclusion

With the use of newer emerging technologies in the field of podiatric surgery, the Cryostar cryoanalgesia system has proved to be an alternative to traditional surgical intervention for plantar fibromas with minimal invasiveness, less post-operative healing time, with fewer risks of complication than traditional surgical excision. One should keep an open mind and expand treatment options by engaging in these new emerging technologies that offer one the ability to provide our patients with the greatest level of care.

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References

- Amoils SP: The Joules Thompson cryoprobe. *Arch Ophthalmol.* (1967) 78:201-207.
- Barnard D: The effects of extreme cold on sensory nerves. *Ann R Coll Surg Engl* (1980);62:180-187.
- Berlin SJ, Members of Maryland Podiatry Residency Research Committee: Soft Somatic tumors of the Foot. Mt Kisco, NY, Futura 1976.
- Costello MJ, Gibbs RC: The Palms and Soles in Medicine. Springfield, Ill, Charles C.Thomas, 1967.
- Fleishclinafer R, Nedwich A, Reeves J: Juvenile Fibromatosis. *Arch Dermatol* 107:554-579,1973.
- Garamy G: Engineering aspects of cryosurgery. In *Cryosurgery*, Rand RW, Rinfret A, von Leden H (eds). Charles C. Thomas, Springfield, Ill, 1968.
- Holden H: *Practical Cryosurgery*, 2-3. London, Pittman, 1975, p.9.
- McGlamry ED, Berlin SJ *Comprehensive Textbook of Foot Surgery*, Volume 2 Chapter 19: Tumors and Tumorous Conditions Chapter 19.
- Miller TJ, Bodman MA: Nodular fasciitis. *J Am Podiatry Assoc* 66:465-470, 1976.
- Wang JK: Cryoanalgesia for painful peripheral nerve lesions. *Pain* 1985; 22:191-194.
- Warfield CA, Cryoanalgesia: Freezing of peripheral nerves. *Hospital Practice* 1987:71-77.
- Warfield CA. New technologies in pain management. *Am Society Anesth.* 55(4)22-23.



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